United States
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Forest Service

Tongass
National
Forest
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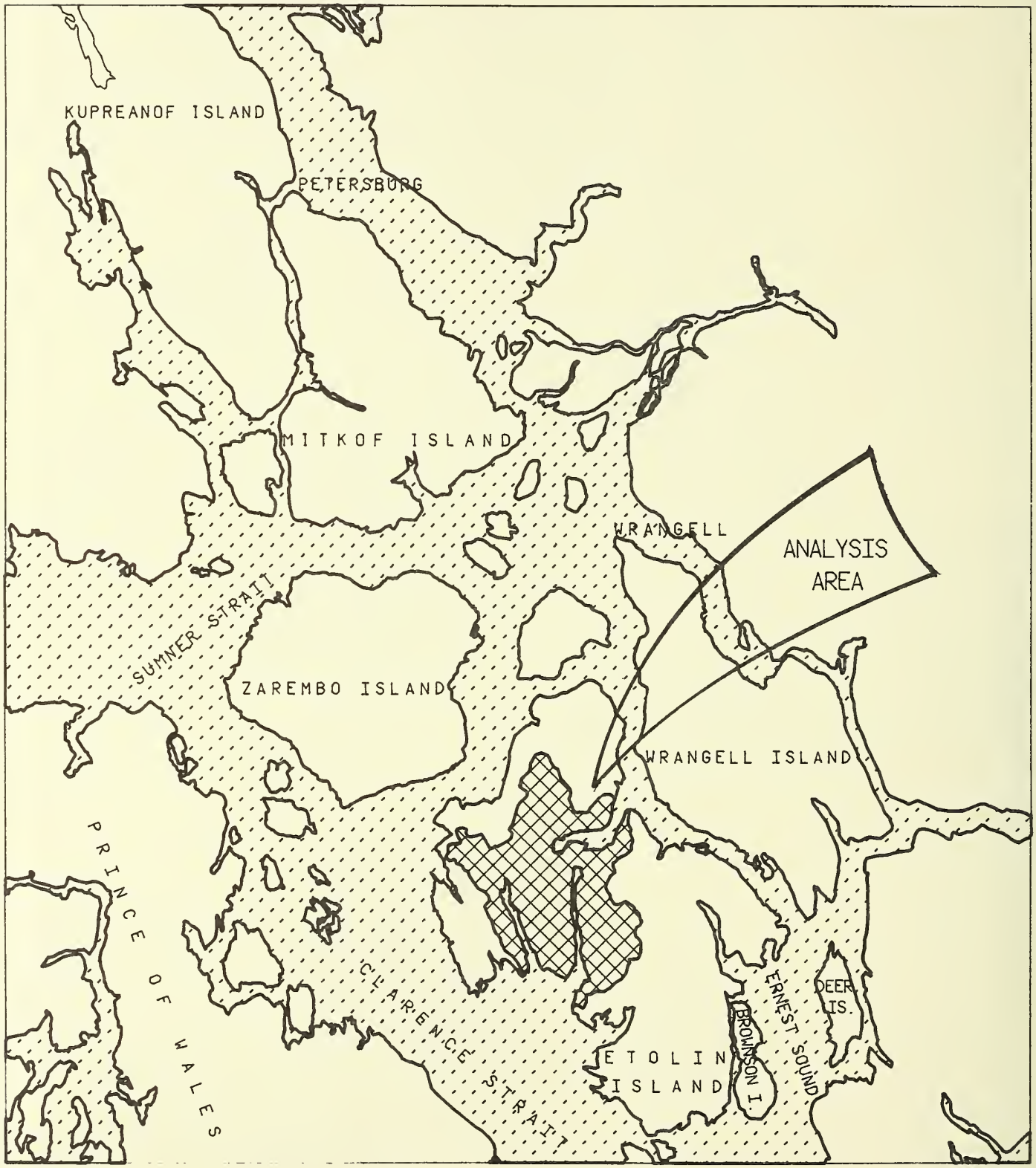
Implementation Analysis for Starfish Timber Sale, Etolin Island

Draft Environmental Impact Statement

Alaska Region
Stikine Area

VICINITY MAP OF
ETOLIN IS. IMPLEMENTATION ANALYSIS AREA



Map Prepared
By a.wilson

Draft Environmental Impact Statement

Etolin Island Implementation Analysis

U.S.D.A. - Forest Service
Tongass National Forest
Stikine Area
March 1991

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Comments Must Be Received:	*Within 45 days of the date of publication of the Draft EIS in the Federal Register. Mail all comments to Richard M. Strauss, IDT Leader, P.O. Box 309, Petersburg, AK 99833.*

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Introduction

This document is the result of an analysis of how best to implement the current Tongass Land Management Plan (TLMP) on Etolin Island. The project proposed in this document is one or more short-term timber sales designed for independent timber sale operators. Independent short-term timber sales are allowed by the Forest Plan (TLMP) in order to maintain a supply of timber for the independent logging community in southeast Alaska. The analysis area is identified in the Forest Plan as land-use designation (LUD) III, managed to "provide a combination of amenity and commodity values", and LUD IV, "for intensive resource use and development where emphasis is primarily on commodity or market resources."

Four action alternatives and a no action alternative were considered in this Draft EIS. Etolin Island was selected as a prototype area to develop and implement the concepts of New Perspectives. These concepts were used as design elements to varying degrees in all of the action alternatives.

Issues

The alternatives were developed to address five issues defined with public involvement. The five issues are:

1. Timber Sale Profitability
2. Appropriate Transportation Network
3. Fish Habitat
4. Wildlife Habitat
5. Visual Quality

Alternatives Considered

Alternative 1

The "Timber Economics Alternative" would harvest approximately 47 million board feet of timber on 1805 acres. An estimated 24 miles of specified road[1] would be constructed.

Alternative 2

The "Maximum Road Development Alternative" would harvest approximately 52 million board feet of timber on 1992 acres. An estimated 32 miles of specified road[1] would be constructed.

Alternative 3

The "Visuals and Wildlife Alternative" would harvest approximately 44 million board feet of timber on 1684 acres. An estimated 24 miles of specified road[1] would be constructed.

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[1] The location and construction standards of these roads are specified by the Forest Service. Specified roads are sometimes referred to as permanent or system roads.

Alternative 4 The "Minimal Fragmentation Alternative" would harvest approximately 45 million board feet of timber on 1720 acres. An estimated 21 miles of specified road would be constructed.

Alternative 5 The "No Action Alternative" would harvest no timber with no new road construction. Existing conditions would be maintained.

Helicopter Logging Helicopter logging is planned for each action alternative in order to provide the opportunity to incorporate group selection with helicopter yarding. To provide an economically feasible helicopter sale, additional helicopter clearcut units have been selected. Helicopter units described as both clearcut and group selection are the same in all of the action alternatives.

Consequences

Each alternative provides a different mix of resource outputs that emphasize different resource values.

Timber All of the action alternatives are identified to be marginally profitable, yielding at the mid-market test approximately 20 - 50 percent of normal profit and risk margin.

Wildlife All action alternatives would harvest varying amounts of high value wildlife habitat. All alternatives however, defer timber harvesting within a 500 foot strip of beach fringe and within a 1000 foot buffer around estuaries.

Fisheries The alternatives are compared for their relative contribution of risk to fisheries based on several measuring factors. These include a combination of total length of roads, total number of stream crossings, total length of buffered and unbuffered stream channel, and total acres of harvest within fish stream watersheds. All of the alternatives would present some risk. Alternative 2 would pose the greatest potential impact to fisheries in terms of the number of Class I and II watersheds entered and total existing and proposed road miles, stream crossings, and percent watershed harvest. Alternative 4 would pose the least potential impact to fisheries in terms of the number Class I and II watersheds entered and total existing and proposed road miles, stream crossings, percent watershed harvest, and unbuffered fish streams.

Visual Resources All of the action alternatives would have visual impacts on viewers travelling in Zimovia Straits, Anita Bay, and the heads of Burnett and Mosman Inlets. Generally, the impacts of the helicopter-logged clearcuts would be less than those associated with the cable-yarded units. Fewer roads would be necessary and more vegetation would be left standing after harvest.

Mitigation of Consequences

If an action alternative is selected, the following steps are required:

(a) The Granite Timber Sale is not scheduled for completion until May 31, 1994. A logging campsite and sort yard are in existence. If requested by contractor, an additional campsite and sort yard could be located for camp housing and sorting logs from the Starfish Timber Sale.

(b) A Forest Service administrative facility is in place, but would be inadequate for the workforce required for the preparation of the Starfish Timber Sale. Additional facilities would need to be installed.

(c) The decision has been made not to use the Olive Cove LTF. The Granite Timber Sale is currently scheduled to use the Starfish Cove LTF. This means that to limit conflicts to only two timber sale operators, the entire volume cleared in this EIS would likely be offered as one large timber sale.
(d) Minimum 330-foot buffers would be maintained around eagle nest trees.
(e) The wildlife retention areas (combined HSI greater than or equal to .7) would be deferred from timber harvesting for all alternatives this planning period.
(f) All known or discovered cultural sites would be protected. If additional sites are discovered once the sale is in operation, protective measures will be taken as per the timber sale contract provisions.
(g) Pursuant to the Tongass Timber Reform Act, commercial timber harvesting within a buffer zone no less than one hundred feet in width on each side of all Class I streams and those Class II streams which flow directly into a Class I stream would be prohibited. In addition, stream protection would include provision of buffer areas and other protective actions consistent with aquatic habitat management unit (AHMU) guidelines pertaining to (1) unstable banks, (2) temperature sensitivity, and (3) sedimentation, and (4) large, woody debris for rearing habitat, nutrient retention, and streambed stabilization.
(h) Where deemed necessary, non-buffered channels would receive protection, such as removal of all introduced slash to prevent debris loading and subsequent washout (see Unit Descriptions, Appendix B).
(i) Full bench construction and end hauling of excess excavated material would be required on designated areas for soil stability (see Road Descriptions, Appendix C).
(j) The visual resource would be protected to the extent required to meet the visual quality objectives for the Etolin analysis area. Boundaries on units have been adjusted to reduce the impact on the view from Anita Bay and Mosman and Burnett Inlet. Landscape design principles would be used in the location and design of rock pits.
(k) All alternatives are planned to "cause the least adverse impact possible on rural Alaska residents who depend upon subsistence use of the resources of such lands".

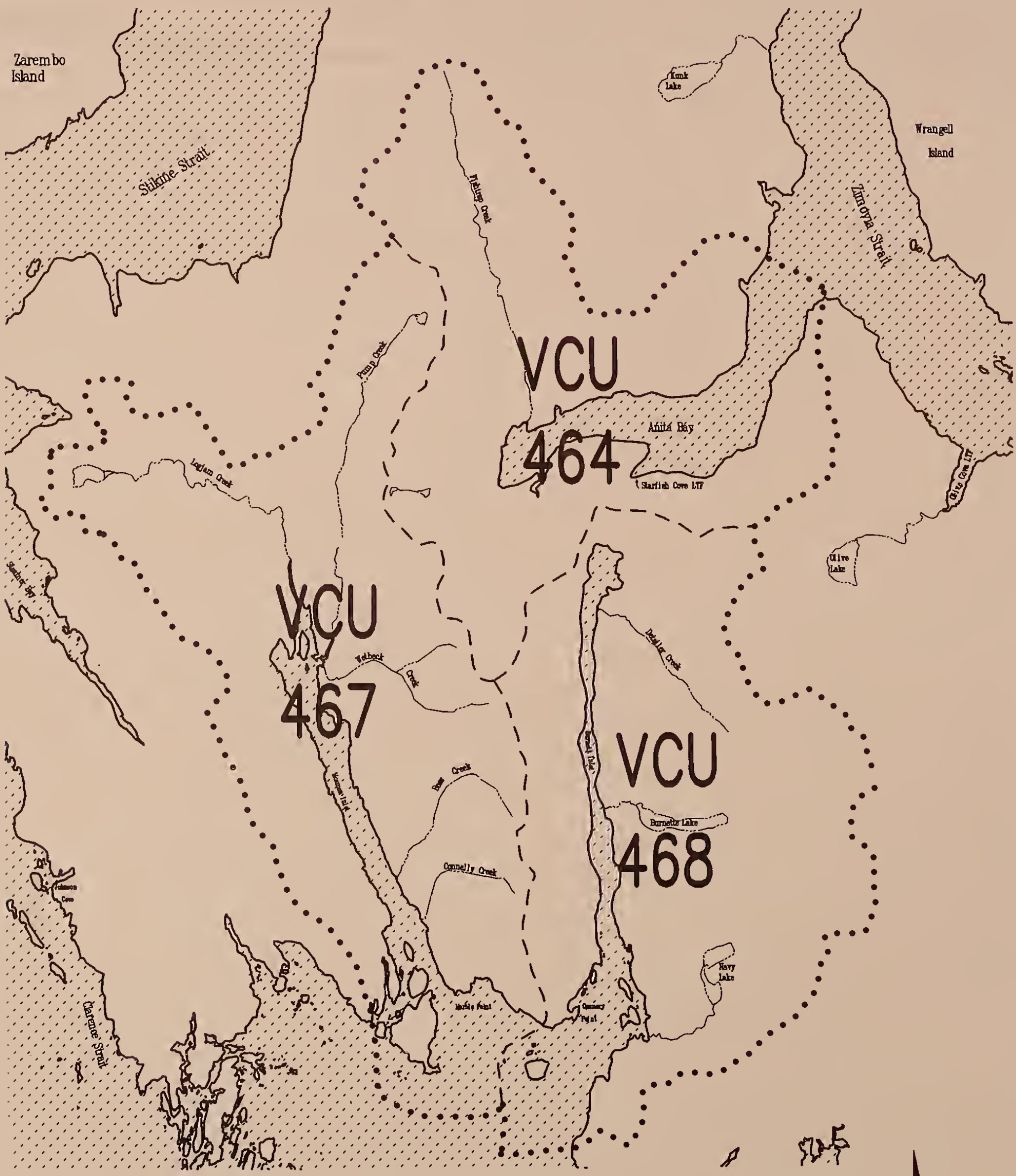
Alternative Preferred by the Forest Service

After reviewing all resource impacts, consequences, and opportunities, Alternative 4 was identified as the preferred alternative.

Chapter 1

Purpose and Need

Etolin Island Implementation Analysis Area



LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- VCU BOUNDARY

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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Prepared by
a.wilson
20 Feb 91

Introduction

Purpose of the Project

The purpose of this project is to provide timber harvest opportunities in one or more timber sales, within an area that includes Anita Bay, Mosman and Burnett Inlets, and Fishtrap Creek drainage. (On all the enclosed maps, the "study area boundary" is the boundary of the analysis area.) This document is the result of an Etolin Island implementation analysis. The analysis area is located on the Wrangell Ranger District of the Stikine Area, Tongass National Forest. The proposed sale or sales would help fulfill the government's commitment to the timber industry, as provided in the current Tongass Land Management Plan (TLMP). The Etolin Island implementation analysis area was selected for a short-term timber sale because:

1. It contains an adequate volume of timber on operable, commercial forest land to provide a profitable timber sale at mid-market prices;

2. It has been specifically identified in the Forest Plan as land use designation (LUD) III, managed to "provide a combination of amenity and commodity values", and LUD IV, for "intensive resource use and development where emphasis is primarily on commodity or market resources;"

3. It is outside the long-term contract area and has been specifically identified in the Tongass Land Management Plan for management "oriented to the development of short-term sales for the independent logging community;" and

4. It is outside of the South Etolin Wilderness area, recently designated by Congress under the Tongass Timber Reform Act.

The analysis area is located in the Etolin Island Management Area S23, Value Comparison Units (VCUs) 464 (Anita), 467 (Mosman), 468 (Burnett) (see map, opposite).

Purpose of the Environmental Impact Statement

The purpose of this Draft Environmental Impact Statement (DEIS) is to describe the alternative approaches to harvesting timber in the Etolin Island analysis area. It describes the environment that would be affected by the project, discloses the significant environmental consequences of each alternative, and responds to the issues identified in the public scoping process. Finally, it identifies the alternative preferred by the Forest Service and allows the public formal review of the process and approach to selecting a preferred.

1 Purpose and Need

Decisions to be Made

The environmental impacts documented in this Environmental Impact Statement provide the basis for the following decisions to be made by the Stikine Area Forest Supervisor and documented in the Record of Decision (ROD):

(a) **How and where should timber sales be scheduled in the immediate future to best address the issues and concerns identified as a result of the scoping process?**

(b) **Where and how should resource protection constraints suggested by the TLMP land allocation be site-specifically identified?**

(c) **If timber harvest and road construction are to occur, what special measures will be needed to protect resource values for fish, wildlife, recreation, cultural, subsistence and visual quality of the area?**

Background

The Tongass Land Management Plan allocated the Forest into four different mixes of resource use. The Forest was divided into approximately 850 land areas called value comparison units (VCUs), each normally consisting of a major watershed or group of minor watersheds. The degree of development and related resource protection intended was indicated by assigning a land use designation (LUD) to each of the VCUs. Designations range from LUD I, wilderness management, to LUD IV, emphasizing commodity resource development with appropriate environmental constraints.

Timber Sale position papers were developed for Anita, Fishtrap, and Marble Point timber sale areas. These papers identified the basic resource outputs of the areas and provided a base for the DEIS. A letter of direction was issued and an interdisciplinary study team was formed in August 1987 to begin an Area Analysis effort for Etolin Island. Public involvement in the process started in December 1987, with letters sent to many groups and organizations, notice placed in local papers, and personal contact made with individuals who expressed interest.

The decision to cancel the area analysis on Etolin Island was made in April 1988. The Forest Service determined that the initial Notice of Intent published for the Area Analysis would be revised because of the significant changes in the analysis approach from one of area analysis that included all of Etolin Island and surrounding islands, to one of a more project-specific implementation analysis for a specified area on Etolin Island. A study plan was completed in December 1989 that initiated an Implementation Analysis on Etolin Island. The first phase (Phase I) of this implementation analysis was to identify and describe the rationale for selecting the specified location of the analysis area. This Phase I analysis identified the three VCUs discussed in this document for further study.

Analysis Process

Forest Service specialists described the project to the public beginning with a new scoping period in December 1989. This included letters, a newspaper article, and personal contacts to identify any new public issues or concerns associated with the proposed project.

More recent inventories and data gathering were conducted to supplement those done in 1987 to identify resources and issues. The data was entered into a geographic information system (GIS) that displays resource values such as sensitive stream zones, important wildlife habitat, timber and soil inventories, and location of proposed harvest units.

This data was used to address the issues and analyze the consequences or effects of each alternative and select the alternative preferred by the Forest Service. Unit and road location cards have been used to document the location of harvest units and roads throughout the life of the project. Resource specialists documented their concerns on the unit and road cards and also recommended how their concerns should be treated. The cards convey the planning intent and help track necessary changes in a project when it moves from the planning stage to on-the-ground action. A sample of unit and road descriptions can be found in Appendix B and C. These descriptions are not "unit or road cards" but the results of the IDT analysis of those cards at this point in time. Unit and road cards for all of the action alternatives are located in the planning record.

Inventories, reports, and other pertinent documents are part of the Etolin Island Implementation Analysis planning record and are available for public inspection at the Stikine Area Forest Supervisor's Office in Petersburg, Alaska.

This DEIS is tiered to the current Tongass Land Management Plan (Amended 1986-1987) and the Forest Service's Alaska Regional Guide (November 1983). Tiering means that the DEIS will follow guidance provided in the Forest Plan and the Regional Guide. Relevant portions of those documents, and others, have been incorporated into the DEIS by reference.

Issues

Starting in December 1989, the interdisciplinary team (IDT) sent out a revised scoping letter to 42 individuals, 12 businesses, 25 organizations, and 8 municipal, state, and federal agencies. A revised notice of intent to prepare an EIS was published in the Federal Register on December 21, 1989. Responses were received from three agencies, six organizations, one business, and six individuals.

The IDT reviewed these current public comments in addition to the 25 responses received from the initial public scoping conducted during Etolin Island analysis effort in December 1986. These comments were used to identify the issues and concerns that needed to be considered for the proposed timber sale. Alternatives were designed to address the following issues to varying degrees:

1. TIMBER SALE PROFITABILITY

(Issue raised by LP Ketchikan Pulp Company) **Would a timber sale or sales within the Etolin Island Analysis Area meet the economic criteria consistent with that of Independent National Forest timber sales?**

Analysis focused on meeting the mid-market test for profitability to industry.

2. APPROPRIATE TRANSPORTATION NETWORK

(Issue raised by LP Ketchikan Pulp Company, and the Olive Cove Homeowners Association) **Would the existing and proposed road network and existing Log Transfer Facility (LTF) at Star Fish Cove be sufficient for the proposed project?**

Analysis focused on the proposed and existing road network and LTF, and on the potential need to tie in the road system with the Olive Cove Road No. 6272 and use the LTF at the mouth of Olive Cove.

3. FISH HABITAT

(Issue raised by several individuals and the Alaska Department of Fish and Game) **How should fish habitat be managed and what effects would timber harvest and related activities have on fish habitat?**

Indicators of responsiveness to this issue include the miles of fish streams that would have timber harvest close enough to Class I and Class II sections requiring streamside buffers per Tongass Timber Reform Act, and the number of road crossings, miles of road, and percent watershed harvest within fish stream watersheds.

4. WILDLIFE HABITAT

(Issue raised by several individuals and the Alaska Department of Fish and Game) **How should wildlife habitat be managed and what effects would timber harvest and related activities have on wildlife habitat?**

Management Indicator Species (MISs), have been identified to reflect the wide variety of wildlife species indigenous to southeast Alaska. Indicators of responsiveness to this issue are the percentage of quality habitat remaining, retention acre selection, projected population numbers, and the number and size of forested blocks remaining. Analysis included Sitka black-tailed deer, marten, black bear, river otter, and bald eagles.

5. VISUAL QUALITY

(Issue raised by individuals who kayak around Etolin Island) **How should timber management activities be designed to protect visual quality and what effect would activities have on the landscapes of the Etolin Island Implementation Analysis Area, especially as seen from Clarence, Stikine and Zimovia Straits, and from Anita Bay, Mosman and Burnett Inlets?**

Visual Quality Objectives (VQOs) were used to evaluate visual quality. Factors to be considered include visibility, visual variety in the area, and the ability of the area to absorb or mask management activities.

Opportunities

Several resource opportunities were identified during the analysis: (1) the opportunity to incorporate New Perspective concepts within each proposed action alternative, (2) the development of a trail system connecting the Fishtrap Creek area with the alpine areas (Virginia Peak) (3) the tie-in connection with the Olive Cove road system to expand road access (4) potential portage access between Anita Bay and the heads of Burnett and Mosman Inlet via the road system.

Approvals Required From Other Agencies

As the lead agency for this environmental compliance action, the Forest Service is responsible for the preparation of the EIS. The Forest Service will make a decision based on the FEIS, to be documented in a Record of Decision (ROD). The Forest Service is also responsible for acquiring permits from the U.S. Army Corps of Engineers, the Alaska Department of Environmental Conservation, the Environmental Protection Agency, and the Alaska Department of Natural Resources. Each of these agencies will make its own decision about whether to issue the following permits:

- The State easement in Anita Bay (north shore of Starfish Cove) for the facility that includes the loading bulkhead, float and the breakwater has expired. The Forest Service needs to renew this permit, which may require a cadastral survey with special instructions from the State. The Corps of Engineers permit for this facility is still valid as long as the facility is in use.

•The log transfer facility (on the south shore of Starfish Cove), rafting area, and log storage area have valid Corps of Engineer and State easement grant permits. The Environmental Protection Agency and the Alaska Department of Environmental Conservation are not directly involved except through the monitoring requirement.

•Any new facilities, modifications to existing facilities, or actions (such as helicopter yarding to saltwater) in Anita Bay would require actions by the following agencies:

1. Corps of Engineers permit (404 permit Rivers & Harbors)
2. Environmental Protection Agency (402 permit)
3. Alaska Division of Governmental Coordination Review
4. Alaska Department of Enviromental Conservation (certificate)
5. Alaska Department of Natural Resources (lease or permit)

•A new land based camp location or the use of a floating camp, if requested by the contractor, would require the following permits:

1. Alaska Department of Environmental Conservation (solid waste permit)
2. Alaska Department of Environmental Conservation (discharge permit)

•The National Marine Fisheries Service and the US Fish & Wildlife Service were consulted to determine the status of Threatened, Endangered or Sensitive animal and plant species or potential critical habitat for those species within the analysis area.

Chapter 2

Alternatives

Introduction

This chapter describes alternative methods of providing short-term timber sales for the independent logging community in Southeast Alaska. The project is currently known as the Starfish Timber Sale.

Process Used to Formulate Alternatives

Four timber harvest alternatives and a No Action alternative were developed to respond, in varying degrees, to the issues described in Chapter 1. All of the action alternatives were constructed through the IDT process to achieve multiple resource objectives within the scope of the project analysis.

***ALTERNATIVE 1** (*Timber Eccnomics Alternative*) was designed to minimize road building with initial timber harvest entry to maximize present net value (PNV) while protecting other resource values and conforming with the current Tongass Land Management Plan.
Timber Sale Profitable? Marginal (mid-market test yields approximately 40 percent of normal profit and risk).
Appropriate Transportation Network: Minimum road construction. The new road network will be constructed to within 2.0 miles of a junction with the existing Olive Cove Road No. 6272.
Fish Habitat: Appropriate Aquatic Habitat Management Unit (AHMU) requirements and Tongass Timber Reform Act buffers will be applied throughout; harvest on inventoried high-hazard soils only if on field examination they are reclassified.
Wildlife Habitat: Some high value wildlife habitat harvested.
Visual Quality: Likely to meet inventoried VQOs with mitigation measures incorporated.

***ALTERNATIVE 2** (*Maximum Road Development Alternative*) was designed to develop the road network to provide access to the majority of operable commercial forest land (CFL).
Timber Sale Profitable? Marginal (mid-market test yields approximately 20 percent of normal profit and risk).
Appropriate Transportation Network: Maximum road construction. The new road network will be constructed to within 0.2 mile of a junction with the existing Olive Cove Road No. 6272.
Fish Habitat: Appropriate AHMU requirements and Tongass Timber Reform Act buffers will be applied throughout; harvest on inventoried high-hazard soils only if on field examination they are reclassified.
Wildlife Habitat: Some high value wildlife habitat harvested.
Visual Quality: Likely to meet inventoried VQOs with mitigation measures incorporated.

***ALTERNATIVE 3** (*Visuals and Wildlife Alternative*) was developed to identify viable timber sale opportunities based on visual and wildlife management objectives.
Timber Sale Profitable? Marginal (mid-market test yields approximately 30 percent of normal profit and risk).
Appropriate Transportation Network: Minimum road construction. The new road network will be constructed to within 0.9 mile of a junction with the existing Olive Cove Road No. 6272.
Fish Habitat: Appropriate AHMU requirements and Tongass Timber Reform Act buffers will be applied throughout; harvest on inventoried high-hazard soils only if on field examination they are reclassified.
Wildlife Habitat: Some high value wildlife habitat harvested.
Visual Quality: Likely to meet inventoried VQOs with mitigation measures incorporated.

***ALTERNATIVE 4** (*Minimal Fragmentation Alternative*) was designed to maintain biological diversity by minimizing entry into large blocks of old-growth timber. This would postpone impacts to old-growth dependent species for an extended period of time. The harvest of operable CFL along the existing road system would be emphasized in order to minimize the construction of new roads.
Timber Sale Profitable? Marginal (mid-market test yields approximately 50 percent profit and risk).
Appropriate Transportation Network: Minimum road construction. The new road network will be constructed to within 0.9 mile of a junction with the existing Olive Cove Road No. 6272.
Fish Habitat: Appropriate AHMU requirements and Tongass Timber Reform Act buffers will be applied throughout; harvest on inventoried high-hazard soils only if on field examination they are reclassified.
Wildlife Habitat: Some high value wildlife habitat harvested.
Visual Quality: Likely to meet inventoried VQOs with mitigation measures incorporated.

***ALTERNATIVE 5** (*No Action Alternative*) was designed as the no-action alternative, in which no new timber harvest activities would occur. Management of the analysis area would continue as currently exist.
Timber Sale Profitable? This 44-52 MMBF of Stikine Area's independent sale program would not be available in 1992.
Appropriate Transportation Network: Existing network.
Fish Habitat: No additional risk.
Wildlife Habitat: Maintain existing condition.
Visual Quality: No additional impacts. Allows previously harvested units more time to visually recover before next entry.

Range of Alternatives

The range of alternatives, as a whole, addresses the issues identified in Chapter 1. Each action alternative is consistent with LUD III and IV guidelines for development in TLMP.

The volume of timber to be harvested ranges from 44 million board feet (MMBF) to 52 MMBF, and the no-action alternative describes the effects of choosing not to prepare a timber sale. All of the four proposed action alternatives would harvest 8 MMBF with a helicopter yarding system, with 2 MMBF of this volume included in the Helicopter Group Selection yarding. The number and shape of units varies by alternative.

The alternatives were developed and designed from an "Adjusted Operable CFL" map (see Map 2-0, page 2-7). This map excludes from harvest approximately one half of the commercial forest land (CFL) in the analysis area (total CFL is shown on Map 3-13, page 3-40).

The first step in developing this map was identifying CFL (land that can produce at least 8000 board feet of timber per acre in 100 years). To minimize the hazard of landslides, all the inventoried high hazard soil areas were initially removed from this base. The IDT then developed a multi-entry layout plan for harvesting the remaining inventoried CFL.

Field reconnaissance showed that much of the timber identified in this layout plan was on the border of being non-commercial (less than 8000 board feet per acre) in addition to being on either high-elevation, unroadable ground or widely scattered among wetlands and riparian areas. This timber was deemed inoperable due to extremely poor economics.

At the same time, after on-the-ground visits, the reconnaissance foresters proposed updating the soil inventory to change the classification of a few high-hazard soil areas to moderate hazard. The areas in question have been included in the operable CFL base in this document. Field visits by a soil scientist will further update the classification before the Final EIS.

The operable CFL was further "adjusted" by removing all timber within 500 feet of the beach and 1000 feet of estuaries. No harvest proposals would be made in this area in order to protect high value wildlife habitat. The timbered areas remaining are presented in Map 2-0. All harvest proposals have been developed from within this area referred to as "Adjusted Operable CFL." Table 2-1 shows the breakdown of the land in the analysis area from which alternatives were developed.

Table 2-1. Development of Adjusted Operable CFL

	VCU 464 Anita	VCU 467 Mosman	VCU 468 Burnett	Analysis Area
Total Land Area	19187	25588	22356	67131
-Non-Forest Land	-4558	-3620	-6035	-14213
-Non-CFL	-4205	-6221	-2184	-12610
Total CFL	10424	15747	14137	40308
-Inoperable CFL	-5617	-8040	-6733	-20390
Operable CFL	4807	7707	7404	19918
-Beach & Estuary Exclusions	-1089	-1623	-1325	-4037
Adjusted Operable CFL	3718	6084	6079	15881

Alternatives Considered but Eliminated from Detailed Study

The Forest Service considered a range of alternatives in order to identify a reasonable set of alternatives to be studied in detail. Those alternatives eliminated from detailed study, along with the rationale for their dismissal, are as follows:

Timber Harvest in SW Mosman and South Burnett Areas

Timber harvest and road construction were analyzed in the areas known as southwest Mosman and south Burnett. These areas, located within the VCUs 467 and 468, are part of the analysis area. It is recommended that these areas be deferred from timber harvest and road construction this planning period because of several identified major isssues and concerns specific to these areas. One issue is the timber profitability and whether a timber sale within these areas requiring separate log transfer facilities and road networks would meet the economic criteria. Also there are fisheries concerns with timber harvesting and road construction south of Burnett Lake and within the Navy Creek drainage.

Alternatives Considered in Detail

The Forest Service developed four alternatives for detailed analysis. Each of these alternatives provides protection for resources; each responds to resource management opportunities such as timber harvest, wildlife habitat management, and visual quality management; and each addresses issues the public and management identified in Chapter 1. However, each alternative provides a different mix of resource outputs that emphasize different resource values.

Assuming an action alternative is selected and the Starfish timber sale is implemented, there will likely be some minor changes to the units and roads as they are described in the EIS. It is impossible to put these plans into effect on the ground without responding to conditions that were not anticipated. For example, sometimes this means developing additional protection for a resource value that had not been recognized. Thus all boundaries, acreages, volumes, and road locations should be considered "best estimates" at the time the EIS is published.

Spur roads are not displayed on Maps 2-1 through 2-4 because their locations may change, with Forest Service approval, according to operator needs and equipment requirements. The spur road mileage listed is an estimate of the amount of road a prudent operator may require. (See Appendix B, Unit Description, for an example of spur road location.)

Design Elements Common to Alternatives 1, 2, 3, and 4

Some of the major design elements common to all action alternatives are:

Standard Elements

Riparian Buffers
Pursuant to the Tongass Timber Reform Act, a buffer zone of no less than one hundred feet in width on each side of all Class I streams and on those Class II streams which flow directly into Class I streams is prescribed in all action alternatives.

Unit Shaping
Units on the south side of Anita Bay visible from Zimovia Strait would be designed to imitate the shapes of natural slides or chutes. Roads in this area would take maximum advantage of natural slope breaks to reduce their visibility.

Roads and Rock Pits
Roads on the south side of Anita Bay would take maximum advantage of natural slope breaks to reduce their visibility. In sensitive viewsheds, rock pits would be placed outside of harvest units and screened by trees whenever possible.

Log Transfer Facility (LTF) and Direct to Saltwater Helicopter Yarding Booming and Rafting Areas.
The existing Starfish Cove LTF and rafting area will be used by all the alternatives for the hauling and dumping of all roaded timber harvest volume. In addition, the booming and rafting areas for the timber volume helicopter-yarded direct to saltwater will be the same for all alternatives.

Helicopter Logging

Helicopter Clearcut	Helicopter Group Selection
6 MMBF timber	*2 MMBF timber*
251 acres land	*69 acres land*
no additional road	*no additional road*

Helicopter logging was considered in each of the Etolin action alternatives in order to provide the opportunity to incorporate group selection with helicopter yarding. To provide an economically feasible helicopter sale, additional helicopter clearcut units have been selected.

There would be no need to construct additional road. Helicopter-yarded volume will be yarded either directly to saltwater or to constructed or existing roaded landings.

Helicopter units described as both clearcut and group selection are the same in all of the action alternatives even though their unit numbers are different.

New Perspective Elements

Etolin Island was selected as a prototype area to develop and implement the concepts of New Perspectives. Below are the New Perspective concepts that were used as design elements common to all timber harvest alternatives.

Internal Exclusions
Large old growth trees within the harvest unit are selected for permanent retention to achieve structural diversity and to visually screen roads and modify blocky unit shapes. These are silviculturally referred to as "internal exclusions" for green tree retention. Because of current limitation of high lead cable yarding, opportunities for retaining these groups, ranging from a one to six acres, are limited to split lines between settings. Unit Description maps in Appendix B show where these groups of trees are planned in sample units.

Group Selection
One component of New Perspectives is a broadened view of possible harvest and yarding techniques to better achieve resource objectives in a more ecologically sensitive manner.

The group selection prescription would be applied in areas of moderate to high visual sensitivity. Small groups one-half to 3 acres in size, ranging from 200 to 400 feet in diameter, will be harvested using helicopter yarding either directly to saltwater or to a road landing. Approximately 10 to 15 percent of the stand would be removed. Visual impacts would be minimal due to small size, and the small group selection would more closely emulate the natural gap phase dynamics and windthrow ecology in southeast Alaska. Impacts to wildlife would approximate those occurring under natural ecological processes.

Maintenance of Large Blocks of Old Growth
One of the major analyses undertaken was to evaluate old-growth stand conditions and patterns over the entire 67,131 acre analysis area. Most of the timber stands in the area are old growth more than 200 years old. Most of the harvested stands are less than 25 years old and the oldest immature stands are approximately 75 years old. All the alternatives incorporated to varying degrees the concept of minimizing entry into large, interconnected blocks of old-growth habitat. This would offer a wider range of landscape management options in the future.

Public input and Participation
Another component of New Perspective is public input and participation. The Etolin implementation analysis effort has been presented at the Regional New Perspective Workshop (July 1990). Other individuals and agencies outside the Forest Service have been solicited for their comments and input.

Retention of High Value Wildlife Habitat within Beach Fringe and Estuaries
Wildlife resource inventory maps were generated using Habitat Capability computer models to evaluate habitat quality, size, and juxtaposition throughout the analysis area. The highest quality overall wildlife habitat was identified by generating a mean wildlife HSI (Habitat Suitability Index) using the individual HSI values of the 5 project management indicator species: bald eagle, Sitka black-tailed deer, black bear, marten, and river otter. All areas with an average HSI of 0.7 or greater were removed from consideration during this project analysis. In general this area consisted of most habitats occurring within a 500' beach fringe buffer and a 1000' estuarine fringe buffer as well as some selected high quality riparian areas. Retention of these habitats in all alternatives resulted in a continuous corridor of high quality habitat extending along the beach fringe throughout the analysis area.

Map 2–0. Adjusted Operable CFL

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Planned Roads
- Existing Roads
- Adjusted Operable CFL
- Existing Clearcuts

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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Prepared
a.wilson
13 Feb 91

Map 2-1. Alternative 1

Zarembo Island
Stikine Strait
Kunk Lake
Wrangell Island
Zimovia Strait
Fishing Creek
Anita Bay
Olive Cove Lit
Olive Lake
Scenery Bay
Vejbeck Creek
Bass Creek
Burnett Inlet
Burnette Lake
Johnson Cove
Clarence Strait
Marble Point
Cemetery Point
Navy Lake
Connelly Creek
Weinner Bay

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

N

LEGEND

- Mojor Streoms
- Study Area Boundory
- Shoreline
- Planned Roods
- Existing Roods
- Proposed Coble Units
- Proposed Helicopter Units
- Proposed Group Selection Areas
- Existing Cleorcuts

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13 Feb 91

Alternative #1

Timber Economic Alternative

ALL LOGGING SYSTEMS	CABLE LOGGING SYSTEMS	HELICOPTER LOGGING SYSTEMS
47 MMBF timber	*39 MMBF timber*	*8 MMBF timber*
1805 harvest acres	*1485 harvest acres*	*320 harvest acres*
24 miles specified[1] road		
2 miles spur[2] road		

Timber. Alternative 1 would harvest 12 percent of the adjusted operable CFL. The 39 MMBF of cable yarding is harvested at a rate of 1.7 MMBF/mile of new specified road. Alternative 1 leaves approximately 30 MMBF uncut along the new and existing road system. This timber can be harvested in the future with no further road building. The helicopter logging units within this alternative are the same for Alternatives 2, 3, and 4. They consist of helicopter clearcut yarding units and group selection yarding units. Map 2-1, opposite, displays the unit locations, LTF, and specified road system as designed.

Visuals. Alternative 1 would visually impact Anita Bay, Zimovia Straits, the head of Burnett Inlet, and the head and eastern side of Mosman Inlet. This alternative has potential to create a visual condition of Maximum Modification in Detailer Creek and along the east side of Mosman Inlet. Within-stand modification and deferral of one unit would allow this alternative to meet inventory VQOs.

Fisheries. This alternative would designate harvest and/or roadbuilding activities in 12 of the 22 Class I fish stream watersheds and 3 of the 8 Class II fish stream watersheds in the analysis area. Within these watersheds, 16 miles of new road would be built requiring 27 stream crossings to harvest 1485 acres of timber with 4 miles of stream buffer.

Wildlife. Alternative 1 would harvest a moderate amount of high value wildlife habitat (see Map 3-2, page 3-7).

---

[1] The location of the road and the construction requirements are specified by the Forest Service. Specified roads are sometimes referred to as permanent or system roads.

[2] Spur roads are designed for short term project needs to provide access between harvest units and specified roads. Spur roads are sometimes referred to as temporary or non-system roads.

Alternative #2

Maximum Road Development Alternative

ALL LOGGING SYSTEMS	CABLE LOGGING SYSTEMS	HELICOPTER LOGGING SYSTEMS
52 MMBF timber	*44 MMBF timber*	*8 MMBF timber*
1992 harvest acres	*1672 harvest acres*	*320 harvest acres*
32 miles specified[1] road		
3 miles spur[2] road		

Timber. Alternative 2 would harvest 14 percent of the adjusted operable CFL. Map 2-2, opposite, displays the unit locations, LTF, and specified road system as designed. This alternative provides for the most timber and constructs the most new road of all the alternatives. The helicopter yarding is the same as in the other alternatives. Road 6272 will be extended to within 0.2 mile of connecting to the Olive Cove system.

The 44 MMBF of cable yarding is harvested at a rate of 1.4 MMBF/mile of new specified road. Alternative 2 leaves approximately 46 MMBF along the new and existing road system. This timber can be harvested in the future with no further road building. This provides for the best economics of future timber sales in the analysis area. The helicopter logging units within this Alternative are the same for Alternatives 1, 3, and 4. They consist of helicopter clearcut yarding units and group selection yarding units.

Visuals. Alternative 2 would visually impact Anita Bay, Zimovia Straits, the head of Burnett Inlet, the head and eastern side of Mosman Inlet, and Marble Point. This alternative has potential to create a visual condition of Maximum Modification in Wetbeck Creek and along the east side of Mosman Inlet. Within-stand modification would allow this alternative to meet inventory VQOs.

Fisheries. In Alternative 2, 16 of the 22 Class I fish stream watersheds, and 3 of the 8 Class II fish stream watersheds would be potentially impacted. Within these watersheds, this alternative would construct 21 miles of road requiring 37 stream crossings to harvest 1672 acres with 5 miles of stream buffer.

Wildlife. Alternative 2 would harvest the greatest amount of high value wildlife habitat.

---

[1] The location of the road and the construction requirements are specified by the Forest Service. Specified roads are sometimes referred to as permanent or system roads.

[2] Spur roads are usually less than 1/2 mile long. The location is selected by the contractor and approved by the Forest Service. Spur roads are sometimes referred to as temporary or non-system roads.

Map 2-2. Alternative 2

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Planned Roads
- Existing Roads
- Proposed Cable Units
- Proposed Helicopter Units
- Proposed Group Selection Areas
- Existing Clearcuts

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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a.wilson
13 Feb 91

Map 2-3. Alternative 3

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Planned Roads
- Existing Roads
- Proposed Coble Units
- Proposed Helicopter Units
- Proposed Group Selection Areas
- Existing Clearcuts

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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Alternative #3

Visuals and Wildlife Alternative

ALL LOGGING SYSTEMS	CABLE LOGGING SYSTEMS	HELICOPTER LOGGING SYSTEMS
44 MMBF timber	*36 MMBF timber*	*8 MMBF timber*
1684 harvest acres	*1364 harvest acres*	*320 harvest acres*
24 miles specified[1] road		
2 miles spur[2] road		

Timber. Alternative 3 would harvest 11 percent of the adjusted operable CFL. Map 2-3, opposite, displays the unit locations, LTF, and specified road system as designed. There would be one unit exceeding the 100-acre size limit described in the National Forest Management Act. The larger unit, however, is less than 150 acres, the maximum size that can be approved by a Forest Supervisor. The 36 MMBF of cable yarding is harvested at a rate of 1.4 MMBF/mile of new specified road. Alternative 3 leaves approximately 25 MMBF along the new and existing road system. This timber can be harvested in the future with no further road building. The helicopter logging units within this alternative are the same for Alternatives 1, 2, and 4. They consist of helicopter clearcut yarding units and group selection yarding units.

Visuals. Alternative 3 provides the greatest benefit for visual resource management of all alternatives. However it would visually impact Anita Bay, Zimovia Straits, the head of Burnett Inlet and the head of Mosman Inlet. This alternative has potential to meet inventory VQOs in each of these areas, but would still require within-stand modification in several units.

Fisheries. Timber harvest and/or roadbuilding would occur in 11 of the 22 Class I fish stream watersheds, and 2 of the 8 Class II fish stream watersheds of the analysis area. The 16 miles of road which would be constructed in these watersheds would require 26 additional stream crossings to access 1364 harvest acres having 2 miles of stream buffers.

Wildlife. Alternative 3 harvests less high value wildlife habitat than Alternative 1 or 2.

---

[1] The location of the road and the construction requirements are specified by the Forest Service. Specified roads are sometimes referred to as permanent or system roads.

[2] Spur roads are usually less than 1/2 mile long. The location is selected by the contractor and approved by the Forest Service. Spur roads are sometimes referred to as temporary or non-system roads.

Alternative #4

Minimal Fragmentation Alternative (Forest Service Preferred Alternative)

ALL LOGGING SYSTEMS	CABLE LOGGING SYSTEMS	HELICOPTER LOGGING SYSTEMS
45 MMBF timber	*37 MMBF timber*	*8 MMBF timber*
1720 harvest acres	*1400 harvest acres*	*320 harvest acres*
21 miles specified[1] road		
4 miles spur[2] road		

Timber. Alternative 4 would harvest 12 percent of the adjusted operable CFL. Map 2-4, opposite, displays the unit locations, LTF, and specified road system as designed. The 37 MMBF of cable yarding is harvested at a rate of 1.7 MMBF/mile of new specified road. Alternative 4 leaves approximately 22 MMBF uncut along the new and existing road system. This timber, the least of all the alternatives, can be harvested in the future with no further road building. The helicopter logging units within this alternative are the same for Alternatives 1, 2, and 3. They consist of helicopter clearcut yarding units and group selection yarding units.

Visuals. Alternative 4 would visually impact Anita Bay, Zimovia Straits, the head of Burnett Inlet and the head of Mosman Inlet. This alternative has potential to create a visual condition of Maximum Modification in Wetbeck drainage and along the south side of Anita Bay. Within-stand modification and deferral of one setting in unit 403 would allow this alternative to meet inventory VQOs.

Fisheries. Harvest and/or roading would occur in 11 of the 21 Class I fish stream watersheds, and 1 of the 8 Class II fish stream watersheds of the analysis area. Within these watersheds, 15 miles of road would be constructed requiring 22 additional stream crossings to access 1400 harvest acres having 2 miles of buffers.

Wildlife. Alternative 4 harvests the least amount of high value wildlife habitat.

---

[1] The location of the road and the construction requirements are specified by the Forest Service. Specified roads are sometimes referred to as permanent or system roads.

[2] Spur roads are usually less than 1/2 mile long. The location is selected by the contractor and approved by the Forest Service. Spur roads are sometimes referred to as temporary or non-system roads.

Map 2--4. Alternative 4

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Planned Roads
- Existing Roads
- Proposed Cable Units
- Proposed Helicopter Units
- Proposed Group Selection Areas
- Existing Clearcuts

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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a.wilson
13 Feb 91

Map 2-5. Alternative 5

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Existing Roads
- Existing Clearcuts

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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13 Feb 91

Alternative #5 **No Action Alternative**

ALL LOGGING SYSTEMS	CABLE LOGGING SYSTEMS	HELICOPTER LOGGING SYSTEMS
0 MMBF timber	*0 MMBF timber*	*0 MMBF timber*
0 harvest acres	*0 harvest acres*	*0 harvest acres*
0 miles specified road		
0 miles spur road		

Timber. Alternative 5 was evaluated to assess the impact of allowing the current management in the area to continue without a timber sale, and to provide baseline information against which other alternatives would be measured. There would be no additional road construction or no additional timber harvest. Currently there is approximately 4 MMBF uncut along the existing road system.

Visuals. Alternative 5 would retain the analysis area in its present visual condition. Existing clearcuts seen from Anita Bay, the head of Burnett Inlet, and the head of Mosman Inlet would have more time to visually recover before the next entry.

Fisheries. No new entries would be made into Class I or Class II fish stream watersheds.

Wildlife. Alternative 5 maintains the existing high value wildlife habitat in its present condition.

Identification of the Forest Service Preferred Alternative

The Etolin IDT met with the Forest Supervisor and staff officers to select the alternative preferred by the Forest Service.

After reviewing all resource impacts, consequences, and opportunities, **Alternative 4** was identified as the preferred alternative.

Mitigation

The following steps are required as part of the timber sale implementation to mitigate consequences:

(a) The Granite Timber Sale is not scheduled for completion until May 31, 1994. A logging campsite and sort yard are in existence. If requested by contractor, an additional campsite and sort yard could be located for camp housing and sorting logs from the Starfish Timber Sale.

(b) A Forest Service administrative facility is in place, but would be inadequate for the workforce required for the preparation of the Starfish Timber Sale. Additional facilities would need to be installed.

(c) The decision has been made not to use the Olive Cove LTF. The Granite Timber Sale is currently scheduled to use the Starfish Cove LTF. This means that to limit conflicts to only two timber sale operators, the entire volume cleared in this EIS would likely be offered as one large timber sale.

(d) Minimum 330-foot buffers would be maintained around eagle nest trees.

(e) The wildlife retention areas (combined HSI greater than or equal to .7) would be deferred from timber harvesting for all alternatives this planning period.

(f) All known or discovered cultural sites would be protected. If additional sites are discovered once the sale is in operation, protective measures will be taken under the timber sale contract provisions.

(g) Pursuant to the Tongass Timber Reform Act, commercial timber harvesting within a buffer zone no less than one hundred feet in width on each side of all Class I streams and those Class II streams which flow directly into a Class I stream would be prohibited. In addition, stream protection would include provision of buffer areas and other protective actions consistent with aquatic habitat management unit (AHMU) guidelines pertaining to (1) unstable banks, (2) temperature sensitivity, and (3) sedimentation, and (4) large, woody debris for rearing habitat, nutrient retention, and streambed stabilization.

(h) Where deemed necessary, non-buffered channels would receive protection, such as removal of all introduced slash to prevent debris loading and subsequent washout (see Unit Descriptions, Appendix B).

(i) Full bench construction and end hauling of excess excavated material would be required on designated areas for soil stability (see Road Descriptions, Appendix C).

(j) The visual resource would be protected to the extent required to meet the visual quality objectives for the Etolin analysis area. Boundaries on units have been adjusted to reduce the impact on the view from Anita Bay and Mosman and Burnett Inlet. Landscape design principles would be used in the location and design of rock pits.

(k) Use of National Forest lands is to "cause the least adverse impact possible on rural Alaska residents who depend upon subsistence use of the resources of such lands".

(l) The sale area improvement plan should consider the following specific projects in addition to the generally required projects:

1. Management for canopy gaps in regrowth within some units and within those identified older immature stands at the head of Mosman and Burnett Inlets
2. Coho rearing enhancement in Pump Creek drainage.
3. Willow and Cottonwood planting along roadsides.
4. Rock pit and roadside rehabilitation as needed (planting of tree seedlings and spraying of rock weathering agents).
5. Stream stabilization.
6. Virginia Peak recreation trail.
7. Mouth of Detailer Creek rehabilitation.

Monitoring

Monitoring is designed to determine if the resource management objectives of the Etolin implementation analysis have been met. The results will be used to verify implementation and effectiveness of selected mitigation and protection measures in a timely manner. Three types of monitoring were recognized in the development of the monitoring plan. They are:

Implementation Monitoring

Implementation monitoring assesses whether the project was implemented as designed and whether it complies with the Tongass Land Management Plan. In completing the Etolin implementation analysis, specialists used on-the-ground inventories, computer inventories, and aerial photographs to prepare cards for each harvest unit. Cards were also prepared for each segment of road. Resource specialists wrote their concerns on the cards and then described how the concerns could be addressed in the design of each unit and road segment. These documents will be used as guidelines in monitoring the harvest of timber in the Etolin analysis area.

Following completion of harvest activity, development impacts will be compared to those described in the Etolin EIS to identify significant differences from what was anticipated. Once again, this information, when and where pertinent, will be noted and added on the unit and road cards. By the end of the timber sale activities, the cards will document the initial plan, the rationale for any changes, and show the project as implemented.

Effectiveness Monitoring

Effectiveness monitoring measures the effectiveness of design features or mitigation measures. The following effectiveness monitoring will be performed following implementation of an action alternative:

- The effectiveness of various riparian buffers and fisheries habitat rehabilitation and enhancement efforts will be monitored by the IDT within one year of completion of harvest activities, and again within five years. Special attention will be focused on the southernmost setting 48 within Unit 418 along Pump Creek, as this is the affected stream segment that produces the greatest number of fish.
- The effectiveness of stream rehabilitation and enhancement will be monitored by the fisheries biologist.
- The effectiveness of the retention areas and windfirm boundaries will be monitored by the wildlife biologist.
- The effectiveness of implemented BMPs will be monitored by soil scientist and hydrologist.
- The effectiveness of within-stand leave trees in acheiving both wildlife and visual resource objectives will be monitored by the wildlife biologist and landscape architect.
- The effectiveness of rock pit and roadside rehabilitation will be monitored by the landscape architect.

Validation Monitoring

Validation monitoring is conducted to validate assumptions made about resource effects. With possible support from the Forestry Sciences Laboratory, the Area wildlife biologists and ecologists will monitor and study the impacts of group selection helicopter yarding in achieving the designated management objectives. They will also analyze the results and evaluate effective patch size maintained for interior forest species.

Table 2-2. Summary of Consequences

ELEMENT OF PROPOSAL	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
TIMBER HARVEST					
Total volume (MMBF)	47	52	44	45	0
Area harvested:					
Acres proposed	1805	1992	1684	1720	0
Cumulative acres	3316	3503	3195	3231	1511
Total commercial forest land (CFL) (out of 40,308 acres)					
Percent proposed	5	5	4	4	0
Cumulative percentage	8	9	8	8	4
Adjusted operable CFL (out of 15,881 acres)					
Percent proposed	11	13	11	11	0
Cumulative percentage	21	22	20	20	10
Standard adjusted operable CFL (can be harvested with standard cable logging systems)					
Acres proposed	1485	1672	1364	1400	0
Cumulative acres	2996	3183	2875	2911	1511
(out of 8956 acres)					
Percent proposed	17	19	15	16	0
Cumulative percentage	33	36	32	33	10
Non-standard adjusted operable CFL (requires helicopter) (out of 6925 acres)					
Acres proposed	320	320	320	320	0
Cumulative acres	320	320	320	320	0
Percent proposed	5	5	5	5	0
Cumulative percentage	5	5	5	5	0
Units over 100 acres	1	0	1	1	0
ROAD CONSTRUCTION					
Miles of specified road construction	24	32	24	21	0
Miles of spur road construction	2	3	2	4	0

Table 2-2. Summary of Consequences (continued)

ELEMENT OF PROPOSAL	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
VISUALS					
Percent of the proposed activities likely to be seen	62	64	54	46	0
(Note: 80 percent of the available operable CFL is seen from visually sensitive travel routes. If VQOs are to be met with harvest activities within stand leave trees and unit shaping are needed)					
WATERSHED SENSITIVITY					
Number of watersheds impacted this entry	22	27	23	19	0
Number of ADF&G watersheds whose cumulative harvest area is within 10 percentage points of Threshold of Concern (TOC) or greater	4	4	4	4	3
Number of ADF&G watersheds whose cumulative harvest area meets or exceeds the TOC	2	2	2	2	2
Number of ADF&G watersheds with threshold concerns impacted in this entry	0	0	0	1*	0
WATER QUALITY/FISH HABITAT					
Proposed miles of buffered fish streams	4	5	2	2	0
Cumulative miles of buffered fish streams	6	7	4	4	2
Proposed miles of unbuffered streams	1	1	1	0	0
Cumulative miles of unbuffered streams	7	7	7	6	6
Proposed number of stream crossings	27	37	26	22	0
Cumulative number of stream crossings	62	72	61	57	35
Proposed miles of road within fish stream watersheds	16	21	16	15	0
Cumulative miles of road within fish stream watersheds	42	47	42	41	26
Proposed % fish stream watershed harvest	6	5	5	6	0
Cumulative % fish stream watershed harvest	11	10	10	11	5

*Watershed Q19C impacted by additional harvest of 2 acres.

Table 2-2. Summary of Consequences (continued)

ELEMENT OF PROPOSAL	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
WILDLIFE					
A. Riparian acres harvested	69	70	70	61	0
B. Percentage of high-quality habitat maintained					
eagle	79	79	79	79	82
otter	92	93	93	93	95
bear	91	90	91	91	96
marten	84	83	85	84	91
deer	59	57	64	66	88

C. Numbers of MIS[1]	1954 estimate	1990	100 yr. projection
eagle	100	89	85
otter	63	56	53
bear	116	114	82
marten	162	156	101
deer	1667	1586	987

D. Average size of forest blocks maintained (acres)	1760	578	1890	2196	2300
SUBSISTENCE					
Extent of Impact on Subsistence Use (none/minor/major/significant)	minor	minor	minor	minor	none
EMPLOYMENT					
Number of Jobs Generated	329	364	308	315	0
Dollar Value of Jobs ($ million)	11.0	12.1	10.3	10.5	0
Dollar Value Secondary ($ million)	77.0	84.78	72.09	73.50	0

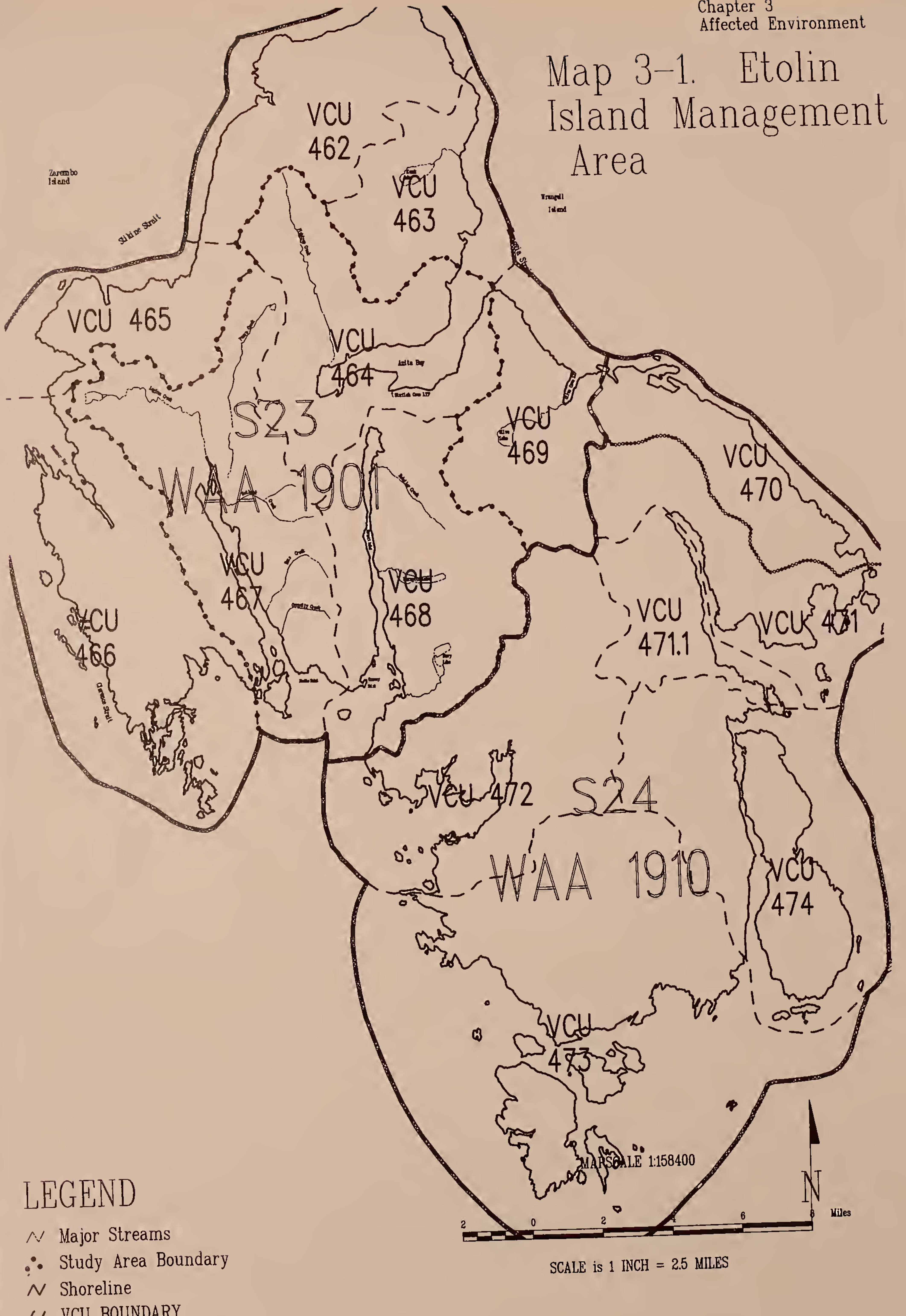
ELEMENT OF PROPOSAL	Cable ALT1	Cable ALT 2	Cable ALT 3	Cable ALT 4	Helicopter CC	Helicopter Grp. Sel
Total Pond Log Selling Value (minus 60% normal profit) $/MBF	248	246	247	247	248	246
Total Costs to Operator ($/MBF)	267	289	278	263	214	273
Net Value ($/MBF)	-19	-43	-31	-16	34	-27

[1]Assuming all operable CFL is harvested as TLMP indicates.

Chapter 3

Affected Environment

Map 3-1. Etolin Island Management Area



Introduction

This chapter describes the environment of the Etolin Island Implementation Analysis Area that would affect, or be affected by, any of the proposed alternatives. The information has been taken from more detailed reports that are available for public review in the planning record, located at the Stikine Area Forest Supervisor's Office, Petersburg, Alaska.

The affected environment includes three value comparison units (VCUs) on the northern portion of Etolin Island, VCUs 464, 467, and 468. The south half of Etolin is managed for wilderness in accordance with the Tongass Timber Reform Act.

TLMP Direction

The Tongass Land Management Plan (TLMP) defines land use opportunities and provides land management direction for the Tongass National Forest.

The Etolin Island analysis area falls within the TLMP North Etolin Management Area S23. TLMP allocated VCUs 467 and 468 to a land use designation (LUD) III (to be managed for a variety of uses and activities in a compatible and complementary manner to provide the greatest combination of benefits). VCU 464 was allocated to LUD IV (to be managed to provide opportunities for intensive development of resources). Emphasis here is primarily on commodity resources while providing for amenity values.

The plan's specific management direction and emphasis in this area is to develop an interconnected road system for timber management and other resource uses if economically and environmentally feasible. Separate systems may be developed depending on geography. New facilities may be required as development begins in isolated areas.

Recreation opportunities and potential will be protected in Steamer Bay, 3-Way Passage, Rocky Bay, Mosman Inlet, and Burnett Inlet.

National Forest management will be compatible to the degree practicable with the State selection land and the private non-profit hatchery in Burnett Inlet.

Wildlife habitat improvement would be developed along with timber sale activities wherever practical.

Major visual quality objectives will range from partial retention to maximum modification with the higher quality objectives in the areas seen from the major water transportation routes. Retention VQO will normally apply to the immediate vicinity of specific recreation features.

For a more detailed description of TLMP and its management direction see the Tongass Land Management Plan and Tongass Land Management Plan Amended Winter 1986-87.

Forest Plan Revision

The Tongass National Forest Land Management Plan (the Forest Plan) is being revised. As part of the revision process, changes in management direction for the Etolin Island analysis area will be considered. Even so, management activities will continue under the direction of the current plan until the revision process is completed. The proposed timber sale is consistent with the current plan direction and is scheduled to be sold prior to the completion of the revised plan.

Wildlife

North Etolin, excluding VCUs 470 through 474 corresponds to Alaska Department of Fish and Game's Wildlife Analysis Area (WAA) 1901 (see Map 3-1 opposite page 3-1). It is assumed that wildlife habitat in South Etolin Wilderness will not change because of forest management activities in the foreseeable future (next 50 years). The analysis area supports a variety of wildlife common to southeast Alaska. Forest Service personnel recorded observations of the following species between 1987 and 1990:

Bald Eagle
Barrow's Goldeneye
Beaver
Black Bear
Brown Bear
Blue Grouse
Brown Creeper
Chickadee (Chestnut-backed)
Dark-eyed Junco
Elk (Rocky Mountain and/or Roosevelt)
Gray Wolf
Harlequin Duck
Hermit Thrush
Great Blue Heron
Golden-crowned Kinglet
Harbor Seal
Humpback Whale
Marten
Pine Siskin
Kingfisher (Belted)
Marbled Murrelet
Mallard Duck
Merganser (Common)
Mink
Moose
Porcupine
Raven
Red Squirrel
Red-tailed Hawk
River Otter
Sitka Black-tailed Deer
Steller's Jay
Toad (Bufo boreas)
Vancouver Canada Goose
Varied Thrush
Winter Wren

Threatened, Endangered, or Sensitive Species

The Humpback Whale, American Peregrine Falcon and Steller Sea Lion were evaluated to determine their presence and habitat requirements within the analysis area. None of the federally listed Threatened, Endangered, or Sensitive species occur regularly within the analysis area. There is neither designated critical habitat nor any site considered for designated critical habitat for the Humpback Whale near Etolin Island. Nor is there designated critical habitat or any site considered for designated critical habitat for the American Peregrine Falcon. Preliminary consultation with the National Marine Fisheries Service indicates that there are no defined haulout areas for Steller Sea lion near the analysis area. There are no federally listed plant species in southeast Alaska. None of the candidate plant species occur near the analysis area (US Fish and Wildlife Service, 1989; National Marine Fisheries Service, 1987 and 1991).

Subsistence

The historical use of wildlife resources on Etolin Island is not well documented. During at least historic times, the Tlingit had seasonal camps located on Etolin Island. Subsistence harvest included: "humpies, cohoes, dog salmon, mink, otter, bear, porcupine and berries," as well as herring eggs. (Goldschmit and Haas, 1946:127). Additionally, hunting and trapping took place (ibid:chart II) throughout the area. A community of approximately 400 individuals was established at Cannery Point in Burnett Inlet during World War II. The community was sustained for approximately five years and then abandoned. Subsistence use of fish and wildlife resources is assumed to have been high during this period.

The communities of Wrangell, Petersburg, Meyers Chuck, Point Baker, Port Protection, Edna Bay, Hydaburg, and Coffman Cove are documented subsistence resource users of the analysis area. Preliminary information available from the Tongass Resource Use Cooperative Study (TRUCS) indicates that the communities of Wrangell, Petersburg and Point Baker are active subsistence resource users of deer, marine mammals, salmon, marine invertebrates, and finfish within the analysis area (TRUCS 1988-1989).

Harvest Records

Prior to the severe winters of 1969 and 1970, north Etolin (near King George Bay) was the preferred hunting site for Wrangell deer hunters. The deer population has not recovered to the pre-1969 population levels and hunter use is currently light. Alaska Department of Fish and Game's 1989 harvest records indicate that 30 deer were taken from the entire island (WAA 1901 & 1910) with an average harvest over the past three years of 25 deer. Harvest records (1989) compiled for north Etolin (WAA 1901) indicate that 28 marten, 5 otter, 5 black bear, 2 beaver, 3 wolves, and 2 wolverines were reported harvested. The average harvest of these species from 1985 through 1989 was 11 marten, 3 otter, 2 black bear, 2 beaver, 2 wolves, and 0.4 wolverines. Bald eagles, which once brought a two dollar bounty, are now protected, and the population appears to be stable (Land, 1990 ADF&G).

Analysis Method

Wildlife species were selected for analysis based on public concerns expressed during the public comment period, and by various agency biologists concerned with monitoring indicator species that would represent habitat requirements for an assortment of other wildlife species (USDA Forest Service Tech. Pub. R10-TP-2, 1986). This analysis was conducted to determine the affected environment of Sitka black-tailed deer, bald eagle, black bear, pine marten, and river otter, referred to as Management Indicator Species (MIS) throughout this document.

Habitat Capability computer models were developed for each of the MIS by a team of biologists representing the U.S. Fish and Wildlife Service, Alaska Department of Fish and Game and the U.S. Forest Service. The biologists assigned numerical values to specific habitat characteristics by relativity of importance to the animal's survival. The quality of habitat is indicated by the Habitat Suitability Index (HSI). The highest HSI value that an area can have is 1.0. This rating means that an area is "*potentially*" the best suitable habitat for maintaining a species. Areas receiving an HSI value of 0.0 or 0.01 would be considered least suitable habitat. An HSI value of 0.25 indicates an area with the cabability to support 25 percent of the MIS that the very best habitat could support.

An example of how the Habitat Capability model for Sitka black-tailed deer assigns relative value of habitat suitability follows:

> Sitka black-tailed deer depend on high volume old-growth forest for survival during moderate to severe winters. A scenario is selected that will emphasize predation and winter characteristics of Etolin Island. The model assumes that winter range is the limiting factor. It occurs below 1200 feet in elevation on north facing slopes and below 1500 feet on east, west, and south facing slopes. Large trees (high volume class), southerly aspects, and low elevations have higher value to deer than small trees (low volume class), non-southerly aspects and high altitudes. Less snow accumulates in the former areas, making it easier for deer to move around and making forage more accessible. Clearcuts, alpine, and muskegs receive the lowest HSI values because summer forage is not considered a limiting factor to the deer population.

The Habitat Capability models provide an objective method to evaluate habitat and determine the effects of implementing timber harvest alternatives. The assumptions used to create the models are based on the compilation of scientific research available. The models, created for each of the MIS, are available for review from the USDA Forest Service and will not be covered in further depth in this document (DRAFT Habitat Capability Models, USDA Forest Service, 1988-1990). Field inventories were conducted by Forest Service wildlife biologists during the summers of 1987, 1988 and 1990 to inventory habitat. Information collected was used to validate the model outputs and identify key wildlife habitat areas. Refer to Map 3-2 (page 3-7) for high value wildlife habitat areas.

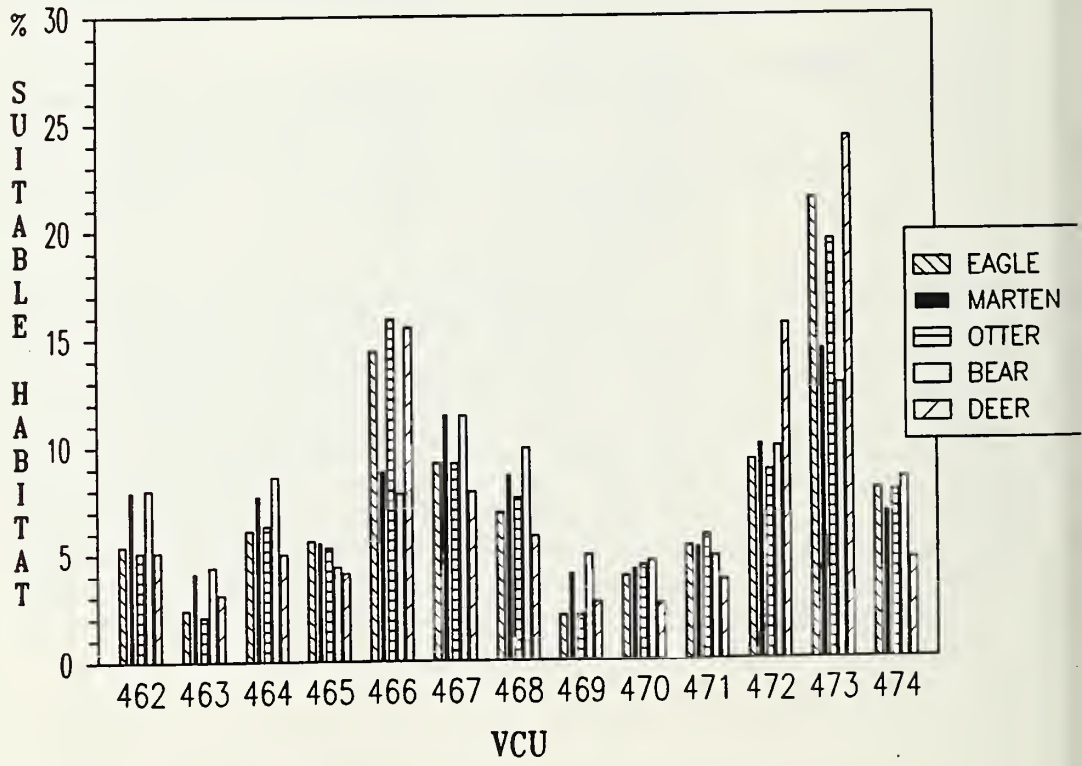


Figure 3-1. Habitat Capability by VCU

The models were used to predict the amount of suitable habitat (by MIS) within the analysis area as compared with the total suitable habitat on Etolin Island. Figure 3-1 on the preceding page is useful but deceptive, because large VCUs with many acres of mid-value habitat may appear to contain a higher percentage of suitable habitat than small VCUs with fewer acres of high-value habitat. The graph displays the percent of suitable habitat by VCU on Etolin Island. The greatest amount of suitable habitat for all of the MIS is predicted to be located in VCU 473 on the south end of the island. The second greatest amount of suitable habitat for black bear and pine marten is within the analysis area (VCU 467). The analysis area also has the third greatest amount of habitat suitable for otter and Sitka black-tailed deer (VCU 467) and black bear (VCU 468). The analysis area contains the fourth greatest amount of suitable habitat for bald eagle (VCU 467).

Cumulative impacts will be addressed by modeling habitat suitability of each proposed timber harvest alternative under four scenarios. These scenarios include: 1) natural condition - prior to any timber harvest (1954); 2) existing situation (1990), alternative implementation (1991); 25 years after implementation (2016); and 100 years after implementation (2091).

The graphs in Appendix A (Q1-3) display the percentage reduction of the highest quality habitat by MIS between 1954 and 2091. The figures for 2091 present a worst case scenario. All of the adjusted operable CFL is assumed to be harvested by this time (see Map 2-0 and page 2-3). Only commercial forest land on high hazard soil areas or within 500 feet of the beach and 1000 feet of estuaries is assumed to remain unharvested at the end of 100 years. It should be noted that viable populations of all MIS are maintained even under the worst case scenario.

Computer models, HSI values, graphs and charts are frequently confusing to people who don't work with them. The underlying question is "How many animals are there and how many will be left after the proposed action?". Therefore, the data was further designed to indicate population numbers of MIS that the habitat is "theoretically" capable of supporting.

The theoretical population predicted by the models is a result of numerous assumptions but does not include such factors such as nutrition, disease, accidents, genetics, predation, immigration, emigration, etc. Population numbers were derived by multiplying the maximum population levels for each MIS (documented to occur in southeast Alaska) by the number of habitat acres and the HSI value per acre that the models assigned. For example: Optimum deer winter habitat (HSI value of 1.0) can support 125 deer per square mile (640 acres) during a mild winter. Therefore the assumption was made that if a VCU had a total of 2,560 acres of habitat with a HSI value of 0.25 it could also support 125 deer during a mild winter.

This method of displaying population numbers is useful but deceptive because it does not consider fragmentation or accessibility between habitat patches. These population numbers will be referred to in Chapter 4, Environmental Consequences, when displaying the effects of alternative implementation on maintaining viable populations, subsistence and sport harvest levels. The reduction in population numbers by MIS is displayed on the next page in Table 3-1 for the 1954-Natural Condition and 1990-Existing Situation scenarios.

Table 3-1. Reduction in Population Levels of MIS (1954 to 1990)

		1954 (pre-harvest) Population Numbers	1990 (existing) Population Numbers
VCU 464 Anita	deer	427	402
	black bear	33	32
	bald eagle	28	24
	marten	44	41
	otter	17	15
VCU 467 Mosman	deer	703	659
	black bear	45	45
	bald eagle	39	36
	marten	69	64
	otter	24	22
VCU 468 Burnett	deer	463	450
	black bear	38	37
	bald eagle	33	29
	marten	49	48
	otter	22	20

The HSI models consistently rated habitat with similar characteristics "highly suitable" for the five MIS species. Overlap between suitable habitat was highest in areas with large old trees, growing at low elevations in close proximity to water. An average HSI value of ≥ .7 was selected to represent a conglomeration of suitable habitat for the MIS. The habitat types identified with an HSI of ≥ .7 were primarily estuary, beach, and riparian.

The Tongass Land Management Plan specifies a percentage of operable commercial forest land by VCU to be retained as wildlife habitat, i.e., no timber harvest through the rotation. The percentage of retention acres specified for a land use designation (LUD) IV (VCU 464) is less than the percentage of retention acres specified for a LUD III (VCUs 467, and 468) because of designed resource emphasis. A combined percentage for the analysis area, representing approximately 21 percent or 4180 acres of operable CFL, represents the number of acres specified for retention by TLMP. The percentage of operable CFL represented by habitat with ≥ .7 average HSI value amounted to 3800 acres, or approximately 90 percent of the TLMP specified retention acreage. An additional 1300 acres (CFL) of high value wildlife habitat for Sitka black-tailed deer and Vancouver Canada goose was identified during 1987, 1989 and 1990 wildlife habitat inventory field reconnaissance. Most of this area was avoided in the design of alternatives. The areas of identified retention habitat (HSI ≥ .7) and the key wildlife habitat areas are shown on Map 3-2(opposite).

Map 3-2. High Value Wildlife Habitat

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Retention Areas
  Combined HSI equal or greater than 0.7
- High Value Wildlife Habitat Areas

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

N

Prepared by
a.wilson
18 Feb 91

Map 3-3. Fish Streams

LEGEND

- Study Area Boundary
- Shoreline
- AHMU Class I
- AHMU Class II
- Existing Roads
- Lakes
- Existing Clearcuts

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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a.wilson

Fisheries

As depicted in Map 3-3 (opposite) and Table 3-2 (pages 3-10,11), the analysis area contains 19 ADF&G-numbered anadromous salmon streams: six in VCU 464/Anita Bay, eight in VCU 467/Mosman Inlet, and six in VCU 468/Burnett Inlet. Level 3 stream survey data is available for all these streams except MI-4 (Boss Creek), located along the eastern shore of Mosman Inlet. The present level of information on this stream is based on aerial photo inventory of channel types.

The salmon, trout, and char species inhabiting the analysis area are pink (*Oncorhynchus gorbuscha*), chum (*O. keta*), coho (*O. kisutch*), and sockeye (*O. nerka*) salmon, steelhead (*O. mykiss*) and cutthroat (*O. clarki*) trout, and Dolly Varden char (*Salvelinus malma*).

Commercial Fisheries

Anita Bay and Mosman and Burnett Inlets support a Dungeness crab fishery. Anita Bay has supported a herring fishery in the past, but not in recent years. Waters adjacent the analysis area also support shrimp and halibut. Streams of the analysis area contribute significantly to the salmon fishery.

A private, non-profit salmon hatchery, operated by Alaska Aquaculture Foundation, Inc. also contributes to the salmon fishery. Pink and chum salmon have been the managed species in the past, but chinook are being added to the expanding facility located at the mouth of Burnett Lake Creek in Burnett Inlet.

Sport Fishery

None of the lakes or streams in the analysis area were listed as "High Quality Sport Fishing Systems" by ADF&G-Sport Fish Division in 1977 for use in developing the Forest Plan.

The larger streams, including Fishtrap and Duckbill Creeks in VCU 464/Anita Bay; Gorbuscha, Logjam, and Pump Creeks in VCU 467/Mosman Inlet; and Navy Creek in VCU 468/Burnett Inlet, have a high potential for some good to excellent sport fishing. Access to those streams draining into Mosman and Burnett Inlets is limited by distance and exposure to open water, which inhibits non-commercial use from reaching high levels. Short-term (5-10 years) intensive sport/subsistence use occurs when logging and other industrial/administrative camps are active on the island. The lack of a permanent boat mooring float as an interface to the road system probably limits the long-term pressure on fish populations by sport use.

Subsistence Fishery

A limited number of streams and bodies of saltwater in the analysis area have been the source of unregulated subsistence harvest. No streams within the analysis area have been regulated by ADF&G for subsistence permit harvest. Intensity of use in terms of numbers of participating households, level of harvest in terms of pounds of fish harvested, and contribution to total household harvest are unknown. (TRUCS 1988-1989)

Salmon Harvest. The waters of Anita Bay and the mouths of Burnett and Mosman Inlets in addition to Goose Lakes Creek/107-30-10780 have been reported as non-commercial salmon harvest areas.

Non-Salmon Finfish Harvest. Included in this category are halibut, rockfish, herring, cod, sole/flounder, trout, etc. The waters of Anita Bay, Burnett Inlet, and the mouth of Mosman Inlet in addition to Fishtrap/107-30-10810, Goose Lakes/107-30-10780, Duckbill/107-30-10760, and Burnett Lake Creeks have been reported as non-commercial non-salmon finfish harvest areas.

Table 3-2. ADF&G Numbered Stream Data

VCU Name	Local Name	ADF&G No	Major Species	Habitat Quality	Mean Escapement		Years of Data		Other Species	Special Considera-tions
					Pink	Chum	Pink	Chum		
1. Anita	Duckbill	107-30-10760	Pink	Fair spawning, Good rearing	1,100	20	5	2	SS,CT	Temperature, 5700 ft to barrier
2. Anita	Goose lakes	107-30-10780	Pink, chum	Good spawning, Excellent rearing	200	60	4	2	SS,DV	Temperature; Lake
3. Anita		107-30-10800	Pink, coho							Short reach
4. Anita	Fishtrap/ Brad	107-30-10810	Pink, chum	Excellent spawning, Good rearing	1,000	350	24	15	SH,SS, DV,CT	Large substrate
5. Anita	AB-3/Falls Cr		Dolly Varden							Needs verification
6. Anita	AB-4	107-30-10840	Coho							Short reach
7. Anita	AB-2/Starfish		Cutthroat	Good rearing						Temp; 600 feet
8. Anita	AB-5		Cutthroat							430 feet to barrier
9. Anita		107-30-02001	Pink, chum							Short reach
10. Mosman	Mirkwood	106-22-10040	Pink, chum	Excellent spawning, Good rearing	3,000	20	18	9	SS,DV,SH	4500 ft length
11. Mosman	Logjam	106-22-10060	Pink, chum	Excellent spawning, Good rearing	16,200	240	33	24	SS,CT, DV,RS,SH	5850 ft ITZ, 5040 ft to barrier
12. Mosman	Pump	106-22-10080	Pink, chum	Excellent spawning, Excellent rearing	8,900	600	38	36	SS,DV,RS	2100 ft ITZ, 10,500 ft length
13. Mosman	Wetback	106-22-10100	Pink, chum	Excellent spawning, Good rearing	1,700	200	19	17	SS	250 ft ITZ, 1290 ft to barrier
14. Mosman	MI-1	106-22-10118	Coho	Good spawning, Good rearing					DV	Temperature, 1500 ft length
15. Mosman	MI-2	106-22-10114	Coho	Poor spawning, Poor rearing					DV	1200 ft length

Table 3-2. ADF&G Numbered Stream Data (continued)

VCU Name	Local Name	ADF&G No	Major Species	Habitat Quality	Mean Escapement		Years of Data		Other Species	Special Considerations
					Pink	Chum	Pink	Chum		
16. Mosman	MI-3/Connelly	106-22-10112	Coho	Poor spawning, Poor rearing					DV	1000 ft to barrier
17. Mosman	MI-4/Boss[1]	106-22-10110	Coho	Poor rearing						Survey needed
18. Mosman	MI-6		Dolly Varden	Poor spawning, Poor rearing						1700 ft length, Narrow
19. Mosman	MI-7		Dolly Varden	Poor rearing						Very short reach
20. Burnett		106-22-10130	Pink	Fair spawning, Good rearing	300	6			SS,DV	Temperature; acid, 300 ft length
21. Burnett	BI-1	106-22-10140	Pink	Fair spawning, Excellent rearing	700	12			SS,CH	1500 ft to barrier
22. Burnett	BI-2	106-22-10144	Pink, chum	Poor rearing	1,500	60	11	6		Short reach
23. Burnett	Navy Creek	106-22-10160	Pink, chum	Excellent spawning Good rearing	10,300[2] 15,700[3]	70[2] 180[3]	20[2] 13[3]	7[2] 9[3]	SS,SH,DV, CT,RS	Temperature; Lake 2400 ft to barrier
24. Burnett	BI-11/Detailer	106-22-10148	Pink, chum		700	20	8	4		1900 ft to barrier
25. Burnett	BI-4		Dolly Varden							Short reach
26. Burnett	BI-5									Short reach
27. Burnett	BI-9		Dolly Varden	Good rearing						Large substrate
28. Burnett	BI-12		Dolly Varden	Poor spawning, Fair rearing						High gradient
29. Burnett	BI-13/Burnett Lake		Dolly Varden						CT	Hatchery water source
30. Burnett	BI-14		Pink	Poor spawning						Fine substrate

[1] Data Incomplete--Survey needed at low water
[2] Pre-enhancement SS = coho SH = steelhead DV = Dolly Varden
[3] Post-enhancement CH = chum CT = cutthroat RS = Sockeye

Marine Invertebrate Harvest. Included in this category are clams, crab, shrimp, octopus, sea cucumbers, herring eggs, etc. The waters of Anita Bay and the mouth of Burnett Inlet have been reported as non-commercial invertebrate harvest areas.

Enhancements

ADF&G and Forest Service jointly installed a Denil steeppass in the lower reach of Navy Creek in 1975. Alaska Aquaculture Foundation Inc. operates a private, non-profit hatchery constructed in 1978 at the mouth of Burnett Lake Creek on the eastern shore of Burnett Inlet.

Productivity/ Escapement

Table 3-2 (preceding pages) summarizes spawning escapement as an indicator of relative productivity of the streams in the analysis area. Logjam, Navy, and Pump Creeks are far and away the most important producers of pink salmon in the analysis area, with mean escapements of 16,200, 15,700, and 8,900 respectively. Pump, Fishtrap, Logjam, Wetbeck, and Navy Creeks are important chum producers with mean escapements of 600, 350, 240, 200, and 180 respectively. Coho are also an important subsistence, commercial, and sport fish species produced by these streams for which escapement data are unavailable. Fishtrap, Mirkwood, and Navy Creeks are known to produce steelhead, a highly valued sportfish species.

Temperature Sensitivity

Those streams with low gradients, east-west orientations, bedrock substrates and/or which drain lakes or extensive muskeg are sensitive to developing high water temperatures. Higher water temperatures not only reduce the oxygen-carrying capacity of the water but affect the metabolism of aquatic animals, including the demand for oxygen. Seven of the twenty streams listed in Table 3-3 are temperature-sensitive. Of these temperature-sensitive streams, Navy and Duckbill Creeks are the most significant fish producers.

Fisheries Goals and Objectives

The Forest Service's goal is to "protect and/or enhance fish resources and their habitat" (*Area Guide*, p.79). Put in slightly different terms, the goal is "to preserve the biological productivity of every fish stream on the Tongass". Protection to reduce risk to water quality and fish habitat can range from precluding roading and timber harvest to the use of management prescriptions that control development activities, monitor effects, and provide for rehabilitation of unforeseen man-caused or natural habitat damage (TLMP, p. 92).

Standards and Guidelines

Results of research published since TLMP (1979) have led to the development of the state-of-the-art guidance published in the Region 10 Aquatic Habitat Management Handbook (FSH 2609.24), which guides development of prescriptions to address limiting factors, and the Soil and Water Conservation Handbook (FSH 2509.22), which contains Best Management Practices (BMPs) for meeting the water quality goals of the Clean Water Act. The aquatic habitat management guidance, which is based on stream channel types and the stream classification system, has yet to be revised subsequent to the recent Tongass Reform Act which limited managers' discretion in formulating and applying prescriptions to anadromous streams. Until regulations are promulgated from the Tongass Reform Act, commercial timber harvesting within a minimum one hundred foot buffer strip on each side of Class I streams and Class II streams tributary to Class I streams is prohibited.

Stream Classification

Stream classification is a value determination that is related to the beneficial uses of water. It is one of a series of descriptive layers that lead to management prescriptions: 1) **channel type** is a *physical* descriptor; 2) **stream class** is a *value* descriptor; and 3) **AHMU prescription** is a *management* descriptor.

Table 3-3. Summary Comparison of Stream Class Lengths by Stream

VCU Name	Local Name	ADF&G No	Stream Length (feet) Class I	Class II	Class III
Anita	Duckbill	107-30-10760	24,000	8,500	22,700
Anita	Goose Lakes	107-30-10780	16,400	2,600	18,800
Anita		107-30-10800	2,600		
Anita	Fishtrap/Brad	107-30-10810	15,900	11,500	53,700
Anita	AB-Falls Cr			6,300	17,400
Anita		107-30-10840	1,300		4,900
Anita		107-30-02001	1,300		
Anita	AB-2/Starfish		2,300		
Anita	AB-5			400	6,100
Anita	(SUBTOTAL)		63,800	23,300	123,600
Mosman	Mirkwood	106-22-10040	3,600	3,900	23,600
Mosman	Logjam	106-22-10060	22,200	7,400	2,500
Mosman	Pump	106-22-10080	33,000	22,000	44,500
Mosman	Wetback	106-22-10100	2,700	5,400	39,500
Mosman	MI-1	106-22-10118	6,200		11,100
Mosman	MI-2	106-22-10114	1,700		
Mosman	MI-3/Connelly	106-22-10112	2,000	5,800	14,300
Mosman	MI-4*/Boss	106-22-10110	4,000	8,200	28,500
Mosman	MI-6			900	
Mosman	MI-7			1,700	
Mosman	(SUBTOTAL)		75,100	55,300	164,000
Burnett		106-22-10130	2,000		
Burnett	BI-1	106-22-10140	4,500		19,200
Burnett	BI-2	106-22-10144	1,900		
Burnett	BI-4			200	3,200
Burnett	BI-5			800	6,100
Burnett	BI-9			1,200	3,200
Burnett	Navy	106-22-10160	8,500	2,200	30,300
Burnett	BI-11/Detailer	106-22-10148	1,900	12,600	35,800
Burnett	BI-12			6,500	10,800
Burnett	BI-13/Burnett Lk			19,300	103,200
Burnett	BI-14		3,700		3,700
Burnett	(SUBTOTAL)		22,500	42,800	215,500
		TOTAL	161,400	127,400	503,100

Class I - habitat or enhanceable habitat for anadromous or adfluvial fish; or high value recreational resident fishery
Class II - habitat for resident fish; or limited value recreational fishery
Class III - no fish populations, but exert direct influence on downstream Class I and II stream water quality
*Data incomplete--survey needed

A summary comparison of channel types comprising important fish streams of the analysis area is provided in the Watershed section, pages 3-33 to 3-36. A description of physical characteristics and management considerations is provided in Channel Types Field Guide--Draft: A Guide to Stream Mapping Units on the Tongass National Forest Chatham/Stikine Area (R10-MB-6). Map 3-3 (page 3-8) displays the Class I and II streams in the analysis area. Table 3-3 (page 3-13) summarizes the stream class lengths of the fish streams in the analysis area. The information summarized in the tables can be used, when integrated with other resource objectives, to develop AHMU prescriptions for streamside forest management.

Rehabilitation and Enhancement

A variety of treatments have proven effective in reducing or eliminating factors which limit fish production. Degree of success or appropriateness of each treatment depends upon fish species and life stage, the factor(s) limiting production, and stream channel type. Upstream access is usually the most obvious limiting factor and is treated by installation of fishways. Other in-stream treatments include the insertion of large woody debris (LWD), boulders, or gabions and the development of rearing ponds or side channels for spawning or rearing.

Rehabilitation Opportunities

The lower reaches of the creeks entering the heads of Mosman and Burnett Inlets were logged in the 1940s using methods deemed unacceptable by today's standards. The existing streambeds appear to have been used as skid roads in yarding the logs to saltwater, severely disturbing fish habitat. Large woody debris (LWD), critical for stabilizing spawning gravels and providing rearing habitat for some species, was displaced or totally removed. These stream sections have only begun to recover to pre-logging conditions due to the relatively short time elapsed, in terms of stand development and LWD recruitment, since harvest.

The lowermost 1000 feet of Wetbeck (Mosman Inlet) and Detailer (Burnett Inlet) Creeks are channel types which have a moderate-to-high probability of responding to rehabilitation treatments such as alder canopy thinning and rearing habitat structure insertion. KV collections from the Granite Timber Sale would likely be the best source of funding for rehabilitating Wetbeck Creek. Regular appropriations or KV collections from this proposed timber sale or future sales could be the source of funding for such work in Detailer Creek. Other nearby streams would not be treated due to channel types and/or fish species present.

Enhancement Opportunities

Logjam/106-22-10060, Wetbeck/106-22-10100, and Detailer/107-22-10140 Creeks have bedrock falls which are complete barriers to upstream migration. These barriers are significant in size and would not be cost-effective to ladder at this time.

Beaver ponds and other low velocity channel types with an abundance of pool area are the most productive for coho salmon smolts. These habitats provide critical overwintering habitat for a variety of species and life stages. The analysis area has some tributaries which have been occupied by beaver in the past, but are presently abandoned, apparently due to lack of food supply. These old beaver pond areas could be rejuvenated by creating artificial dams or by planting hardwood forage for beavers or both.

Existing Risk

Development of roads and, to a lesser degree, timber harvest present an as yet unquantifiable risk to water quality and fish habitat. This relative risk is expressed in miles of road, number of stream crossings, miles of buffered/unbuffered stream, and percent watershed harvest. The application of BMPs in selecting how and where to construct road and harvest timber significantly reduces risk, but does not totally eliminate it. Portions of the analysis area have been previously developed; thus some risk to fisheries already exists. This is summarized in Table 3-4, Existing Relative Risk in Class I Stream Watersheds. This information provides a baseline from which to make comparisons of risk presented by the Alternatives in Chapters 2 and 4.

Table 3-4. Existing Relative Risk in Class I Streams Watersheds

VCU	Name/ADF&G Stream No.	Miles of Road	Stream Crossings	% Watershed Harvested	UnBuffered Miles	Buffered Miles
Anita	Duckbill/107-30-10760	3	2	8%	0.2	0.3
Anita	Goose Lakes/107-30-10780	2	4	1%	-0-	0.1
Anita	Fishtrap/107-30-10810	-0-	-0-	<1%	0.6	-0-
Anita	107-30-10840	-0-	-0-	6%	-0-	-0-
Anita	Starfish	1	2	1%	-0-	-0-
Mosman	Logjam/106-22-10060	12	21	13%	4.6	-0-
Mosman	Pump/106-22-10080	6	4	4%	0.6	0.7
Mosman	Wetbeck/106-22-10100	1	2	4%	0.2	0.7
Burnett	016-22-10130	1	-0-	1%	-0-	-0-
Burnett	016-22-10140	1	-0-	3%	-0-	-0-
Burnett	Detailer/106-22-10148	-0-	-0-	<1%	0.2	-0-

Recreation

Recreation Opportunities

The Recreation Opportunity Spectrum (ROS) is a recreation resource inventory aid which rates an area as to its ability to provide a certain type of recreational setting. It identifies for recreationists the type of experience they can expect to find in an area. Recreation opportunities are described in terms of eight different classifications. The ROS for the entire Wrangell Ranger District has been determined and a portion of that information is used in this analysis.

Only five of the ROS classes have been identified within this analysis area (see Map 3-4, opposite). The acreage within each of the ROS classes is listed in Table 3-5.

The ROS shows the largest opportunity class within the analysis area to be designated Semi-Primitive Non-Motorized (SPNM). This is due to the remote and unroaded condition of most of the analysis area. The areas of SPNM are undeveloped and removed from the sights and sounds of motorized uses and access.

In contrast, the Semi-Primitive Motorized (SPM) areas are also unroaded but not so removed. The sights and sounds of motorized equipment are evident from beyond the area. The SPM the second largest opportunity class. This is due to the extensive salt water access around the analysis area. Motorized boat traffic occurs along the shoreline extending around the area plus within the area in Anita Bay and Burnette and Mosman Inlets.

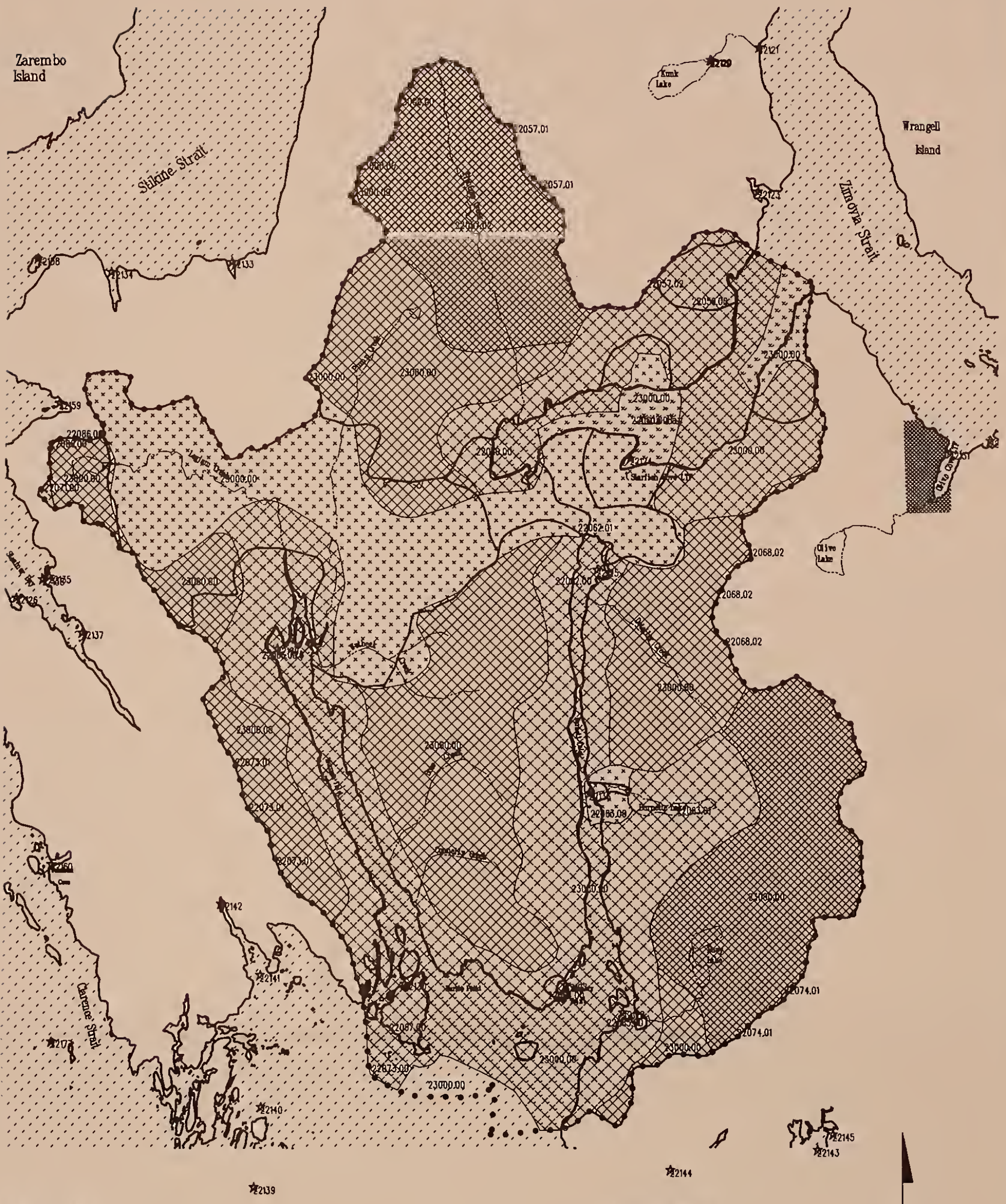
There is also motorized vehicle traffic on the existing Forest Road system within the Roaded Modified (RM) area. The RM is the fourth largest opportunity class and shows the portion of the analysis area where roads have been constructed and trees have been harvested.

The areas designated Primitive (P1 & P2) are the third largest opportunity class in the analysis area. These areas are very remote with no development or facilities. These are generally the high elevation areas within the analysis area far removed from the evidences of man's activity.

Table 3-5. Acres of National Forest Land by Recreation Opportunity Spectrum (ROS) Class

ROS Class	Acres
Primitive 1 (P1)	13,429
Primitive 2 (P2)	55
Semi-Primitive Non-Motorized (SPNM)	22,619
Semi-Primitive Motorized (SPM)	19,539
Roaded Modified (RM)	11,491

Map 3-4. Inventory R.O.S.



LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- P Primitive
- SPM Semi-Primitive Motorized
- SPNM Semi-Primitive Nonmotorized
- X Not a ROS
- RM Roaded Modified
- Other Ownership
- REC-SITE

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18 Feb 91

Recreation Places

Recreation Places are sites where recreational activities are known to occur. All the places have a natural feature which draws people to want to recreate in the area. There are both developed and undeveloped recreation sites in the inventory. All the known recreation places on the Wrangell Ranger District have been inventoried and a portion of that information is used in this analysis.

Various dispersed forms of recreation occur throughout most of the analysis area. Ten recreation places have been identified within the analysis area and sixteen more on north Etolin outside the area. Most of the recreation places on North Etolin are currently undeveloped and are centered around an anchorage. There are no developed Forest Service recreation sites within the analysis area; however, there are three developed recreation places on north Etolin outside the analysis area. These are the Steamer Bay recreation cabin, and the Kunk Lake shelter and trail. Table 3-6 is a listing of the known Recreation Places on North Etolin Island along with their known recreation major activities. There may be more places and activities than those listed.

Table 3-6. Recreation Places and Major Activities on North Etolin Island

Recreation Place	Major Activities
--Within the analysis area	
1. Head of Burnett Inlet	Anchorage, power boat use, big game hunting, waterfowl hunting, scenery site
2. Burnett River and Lake	Anchorage, scenery site, power boat use,stream fishing, big game hunting, scenery site
3. Cannery Cove	Anchorage, scenery site, power boat use, big game hunting
4. Navy Creek	Anchorage, scenery site, power boat use, stream fishing, big game hunting
5. Mosman Islands	Anchorage, power boat use, beach-combing, big game hunting
6. Head of Mosman Inlet	Anchorage power boat use, stream fishing, big game hunting, waterfowl hunting
7. Virginia Bay	Anchorage, big game hunting, waterfowl hunting
8. Starfish Cove	Boating site, power boat use
9. Head of Anita Bay	Stream fishing, big game hunting, waterfowl hunting

Table 3-6. Recreation Places and Major Activities on North Etolin Island (continued)

--Outside the analysis area but on N. Etolin	
10. Olive Lake	Lake fishing, big game hunting
11. Kunk Creek and Lake	Trailhead, recreation shelter, hiking, stream fishing, lake fishing, recreation shelter use, big game hunting, viewing scenery, lake fishing, dispersed camping, mountain/ice climbing
12. Dog Salmon Creek	Power boat use, stream fishing, big game hunting, waterfowl hunting
13. Olive Cove & Snake Creek	Anchorage, power boat use, stream fishing, big game hunting
14. East Olive Cove	Anchorage, boating site, power boat use
15. McHenry Inlet & Hatchery L.	Anchorage, viewing wildlife, power boat use, stream fishing, big game hunting, lake fishing
16. Jadski Cove	Anchorage, viewing wildlife, power boat use, big game hunting
17. Three Way Passage	Anchorage, viewing scenery, power boat use, beachcombing, big game hunting
18. Rocky Bay & Streets Lake	Anchorage, power boat use, hiking, stream fishing, beachcombing, big game hunting, lake fishing
19. Lincoln Is.	Observation site - fish/wildlife, viewing wildlife
20. Johnson Cove	Anchorage, power boat use, viewing from marine access, beachcombing, big game hunting
21. Steamer Bay & Porcupine Cr.	Anchorage, recreation cabin, power boat use, stream fishing, beachcombing, recreation cabin use, big game hunting, waterfowl hunting
22. Kindergarten Bay	Anchorage, power boat use, beachcombing, big game hunting

Table 3-6. Recreation Places and Major Activities on North Etolin Island (continued)

23. Quiet Harbor	Anchorage, power boat use, big game hunting
24. Egg Harbor	Anchorage, power boat use
25. King George Bay & Creek	Anchorage, power boat use, beach - related waterplay, stream fishing, picnicking, dispersed camping, big game hunting, waterfowl hunting
26. Honeymoon Creek	Beach - related waterplay, stream fishing, big game hunting

Lands

All of the land within the analysis area is part of the Tongass National Forest. The nearest non-federal land is at Olive Cove. Both State and private land occur at the head and along the north shore of the cove. The State of Alaska had selected about 524 acres and has disposed of a portion of this land to the public. Currently there are about six homes/cabins developed on the private lands.

The Forest Service, through various agreements and permits, establishes uses and sets priorities for National Forest lands. A special use permit grants to the holder, for a fee, certain rights and privileges within the National Forest. Although these agreements in themselves do not preclude other Forest Service activities, they need to be recognized and considered when doing analysis for a land use plan.

There are eleven permitted special uses and two memorandums of understanding for activities and sites on North Etolin Island. Seven of these are within the analysis area. These uses need to be recognized and considered during this analysis process. Table 3-7 below is a listing of the current and pending special uses and memorandums of understanding on North Etolin Island.

Table 3-7. Permitted Special Uses and Memorandums of Understanding on North Etolin

Permittee Cooperator	Use and Location
--Within the analysis area	
1. Alaska Aquaculture Inc. Burnett Inlet Fish Hatchery	Fish hatchery site on Burnett Inlet which also uses Burnett Lake as a freshwater source for brood stock & hydropower.
2. Mosman Joe Oysters	Oyster farm at Mosman Island.
3. Southeast Management & Trading Company, M/V Observer	Outfitter/guide with permitted use at Anita Bay.
4. Angling Adventures, M/V Star Queen	Outfitter/guide with permitted use of entire Etolin Island
5. USDA Forest Service	Electronics Site in the Keating Range.

Table 3-7. Permitted Special Uses and Memorandums of Understanding on North Etolin (continued)

6. Alaska Power Authority, Tyee Hydro-electric Project	Electronics Site on Navy Peak.
7. State of Alaska, Department of Fish & Game	Memorandum of Understanding for an aluminum fish pass and maintenance/ storage cabin on Navy Creek.
--Outside the analysis area but on N. Etolin	
8. Robin Larsson	Oyster Farm at Three Way Passage.
9. John Nielson	Oyster Farm in Rocky Bay.
10. All Aboard Yacht Charters	Outfitter/guide with permitted use in Steamer Bay.
11. Alaska Seacoast Charters, M/V Discovery	Outfitter/guide with permitted use at Snake, Kunk and Streets Creeks.
12. Julian J. Gustin, dba Alaska Charter Service	Outfitter/guide with permit pending for use at Olive Cove.
13. USDI National Marine Fisheries Service	Memorandum of Understanding for a research camp and a fish weir at the head of Steamer Bay.

Minerals

An inventory of mineral development potential was conducted by the US Bureau of Mines, Alaska Field Operations Center, Juneau Branch during 1989. This inventory indicated no areas of high mineral development potential within the analysis area or on Etolin Island.

The Bureau of Land Management (BLM) Mining Activity Report, dated October 3, 1988, indicates no mineral claims within the analysis area. The report indicates that a number of mineral claims had been filed with the BLM but that all cases have either been closed with no conveyance or deemed abandoned and are void.

Cultural

Cultural resources include the evidence of past human activity, potentially dating from the first occupation of southeast Alaska to the recent past. Information on the prehistory of the region is limited, and Etolin Island is poorly known. Some sites in the region, including the Ground Hog Bay site on the Chilkat Peninsula and the Hidden Falls site on Baranof Island, indicate the occupation of southeast Alaska dates to nearly 10,000 years ago. Evidence suggests Etolin Island was deglaciated and available for human use by at least 9000 years ago, although no sites of that age have been documented.

Affected Environment 3

Map 3-5. Seen and Non-Seen Areas

The Stikinkwan Tlingit occupied Etolin Island at the time of Euroamerican contact. The Stikinkwan was the most prominent of all southern Tlingit groups, and next to the Chilkat, they were considered the most powerful and aggressive of all the Tlingit. Several clans of the Stikinkwan occupied small villages on Etolin Island. Their pattern of settlement changed abruptly, however, once the Russians constructed a fort at Wrangell in 1834. At that point, many of the local Tlingit groups abandoned their traditional sites and moved to or near Wrangell. Over the course of time, Tlingit people lost knowledge pertaining to the locations of traditional sites.

Aboriginal site types known to occur on Etolin Island include villages, middens, camps, fish weirs, forts, culturally modified trees and petroglyphs.

The Etolin Canoe (PET-089) is the only site in the analysis area listed in the National Register of Historic Places. This site has a protective buffer and will not receive impact. No other sites are listed on or considered eligible for the National Register

The first documented historical activity on Etolin Island consisted of construction of a fish hatchery on McHenry Inlet in 1882. Other fishing-related development included a saltery at Olive River and McHenry Inlet and a cannery at Canoe Pass and Burnett Inlet. Other historical development included fox farms on and adjacent to the island and commercial logging which began by at least 1917. The north shore of Etolin Island saw intensive use for trapping fur bearers and there are sites associated with this activity.

Cultural resource inventories on Etolin Island have been conducted on a reconnaissance level by Sealaska and the USDA Forest Service. Sealaska Corporation contracted for an archaeological-historical survey of the region to locate historical and cemetery sites for selection under Section 14 (h)(1) of the Alaska Native Claims Settlement Act. This effort resulted in the identification of three sites on Etolin Island although Sealaska did not submit any of these for consideration under 14 (h)(1). Forest Service inventories have been carried out, primarily in association with project activities. A total of 48 sites have been identified on Etolin Island as a result of these inventories. A detailed cultural resource overview of Etolin Island, entitled *The Bitter Water People: A Cultural Resources Overview of Etolin Island, Southeast Alaska* has been prepared under contract to the Forest Service and is available for review at the Stikine Area Supervisor's Office.

Visual Resource

Landscape Character

Etolin Island is a scenic area of great landscape diversity. Landforms consist of high, glacier-scarred rocky mountains separated by flat-floored muskeg valleys or deep fiords. The lower parts of most valleys are "drowned," forming many bays and long inlets. Vegetative cover ranges from muskeg through low deciduous, dense conifer, to sub-alpine and alpine varieties.

Sensitive Viewpoints

The *western side* of the analysis area is viewed from Clarence and Stikine Straits. These are designated high visual sensitivity travel routes, being frequently used by the Alaska Marine Highway System and by commercial and recreational vessels. Ferries and cruise ships using Clarence Strait typically view the analysis area in the background distance zone (4 miles +). Smaller vessels pass within the foreground (0 to 1/2 mile) or middleground (1/2 to 4 miles). Navy Peak is the most dominant landform seen from Clarence Strait. Upon entering Stikine Strait, views of the analysis area are limited to scattered glimpses in the middle and background; the foreground and close middleground are outside the analysis area.

Anchorages in or within view of the analysis area on Etolin's western shoreline include McHenry Inlet, McHenry Anchorage, Cannery Cove, Quiet Harbor, and Steamer Bay. The first three are designated as medium visual sensitivity; the last two as high visual sensitivity. A Forest Service recreation cabin is located in Steamer Bay but offers no clear views into the analysis area.

The *eastern side* of the analysis area is viewed from Zimovia Strait. Frequently used by local fishing and recreational vessels, Zimovia is designated a high visual sensitivity route. Vessels traveling this route view the landscape as middleground.

Anita Bay, with its higher concentration of commercial use than recreational use, is designated a medium sensitivity route. A Forest Service-owned LTF is located at Starfish Cove in Anita Bay, with a logging camp nearby. Rising above timberline, Virginia Peak attracts viewer interest as the highest landform seen from within the bay. This peak is also the main focal point for persons boating northward up Burnett Inlet. Anita Bay is used as an anchorage when wind conditions permit.

Individuals traveling north-south *by air* frequently fly along Zimovia Strait or follow a Burnett Inlet/Anita Bay route. These air routes are designated medium visual sensitivity, and landforms seen as middleground were included in the mapping process.

Seen Area

Approximately 66 percent of the analysis area is seen from the travel routes and recreation sites described above (see Map 3-5, page 3-24). Broken down by VCU, 71 percent of the Anita Bay VCU (464), 48 percent of the Mosman Inlet VCU (467), and 82 percent of the Burnett Inlet VCU (468) are seen from high or medium visual sensitivity travel routes.

Visual Quality Objectives

Visual Quality Objectives (VQOs) are standards for managing visual change in the landscape. They suggest varying degrees of acceptable modification based on viewing distance, landscape character, and viewer interest in scenic quality. In areas of high scenic value and high viewer interest, VQOs of Partial Retention and Retention suggest managing for little or no visible change in the landscape. VQOs of Modification and Maximum Modification indicate the area is rarely seen or is relatively low in scenic value, and change would not be noticeable or of great social consequence. "Inventory" VQO's are objectives reflecting only the visual resource concerns in a given area and do not incorporate timber or other resource values. The inventory VQOs may or may not be met by the selected alternative. Selection of the alternative includes the decision of whether or not to meet inventory VQOs.

Map 3-6 (opposite) identifies inventory VQOs for the analysis area. Approximately 45 percent of the entire analysis area is mapped as Retention and Partial Retention. These VQOs primarily occur on land viewed from visually sensitive travel routes where the landscape character attracts interest. The remainder of the analysis area, approximately 55 percent, has been mapped as Modification or Maximum Modification. See Table 3-8, below, for a breakdown of VQOs by VCU.

Table 3-8. Percent of VCU and Analysis Area in Each VQO

VQOs	VCU 464 Anita	VCU 467 Mosman	VCU 468 Burnett	Analysis Area
Retention	8%	1%	2%	3%
Partial Ret.	46%	23%	59%	42%
Modification	44%	51%	39%	45%
Maximum Mod.	2%	25%	0%	10%

Map 3-6. Inventory Visual Quality Objectives

LEGEND

- Mojor Streoms
- Study Areo Boundory
- Shoreline
- Retention 3 percent
- Partiol Retention 42 percent
- Modification 45 percent
- Max. Modificotion 10 percent

Map 3-7. Inventory Visual Management Classes

Visual Management Classes

Visual Management Classes (VMCs) identify areas where greater care may be needed in designing management activities that won't conflict with visual quality objectives. VMCs combine VQO and landscape character data (such as percent slope) to identify the relative ease with which VQOs may be met given certain ground conditions.

Map 3-7 (opposite) identifies VMCs for the analysis area. Approximately 49 percent of the entire analysis area -- 75 percent of the seen area -- is mapped as VMCs 1 and 2, the most sensitive seen area. Proposed activities which overlap these VMCs will need extra attention during project design. VMCs 3 and 4 indicate areas where inventory VQOs will be easier to meet or where management activities are not likely to be seen. See Table 3-9 for a breakdown of VMCs by VCU.

Table 3-9. Percent of VCU and Analysis Area in Each VMC

VMCs	VCU 464 Anita	VCU 467 Mosman	VCU 468 Burnett	Analysis Area
1	14%	9%	19%	14%
2	33%	23%	47%	34%
3	47%	18%	33%	31%
4	6%	50%	1%	21%

Existing Visual Condition

Related to the question of how easily change may be visually absorbed by a landscape is the question of what has happened there already? Previous change can make additional change less noticeable if activities were well designed. If they were not well fitted to the landscape, previous activities may prompt a negative public reaction to further change.

Map 3-8 (page 3-31) generally shows where past management activities within the analysis area are still visible from sensitive travel routes. These impacts, affecting 23 percent of the analysis area, are related to the Quiet and Granite Timber Sales, the Anita Bay LTF and logging camp, Burnett Lake hatchery, logging and cannery activities around Cannery Cove, and A-frame harvesting adjacent to Anita Bay. Seven existing harvest units are seen from Anita Bay, two from the head of Burnett Inlet and four from the head of Mosman Inlet. At this time, resource management activities have altered approximately 27 percent of the seen area in the Anita Bay VCU, 7 percent of the seen area in the Mosman Inlet VCU, and 5 percent of the seen area in the Burnett Inlet VCU. Negative cumulative effects are likely to be greatest in areas where existing modifications overlap with more sensitive VMCs 1 and 2, and with proposed new activities.

Soils

In upland soils typical of the Etolin analysis area, tree rooting is generally very shallow, with most of the roots present in the surface organic layers and the upper few inches of mineral soil. Shallow rooting and relatively high concentrations of plant nutrients in surface organic layers together with the fact that organic layers seldom if ever become dry during the growing season suggest the high importance of surface organic layers for tree growth.

Soil productivity and nutrient status can be influenced in a number of ways by timber management activities. With a substantial proportion of nutrient capital of these soils in the upper organic-rich layers, any destruction or removal of these layers will have a severe adverse effect on tree growth. This can occur by landslides, surface erosion, severe burning, severe yarding disturbance, or by displacement by roads, skid trails, landings, or rock pits. These soils can also be damaged by compaction or puddling which impairs soil drainage and therefore reduces productivity. Conversely productivity can also be enhanced resulting from timber management activities where soil drainage is improved.

Most undisturbed soils in the Etolin analysis area are very resistant to surface erosion. Thick layers of surface organic matter and surface mats of vegetation act as protective covers that minimize surface erosion. Locations vulnerable to surface erosion and mass wasting (landslides) exist, however, including stream banks, snowslide or avalanche slopes, and V-notches.

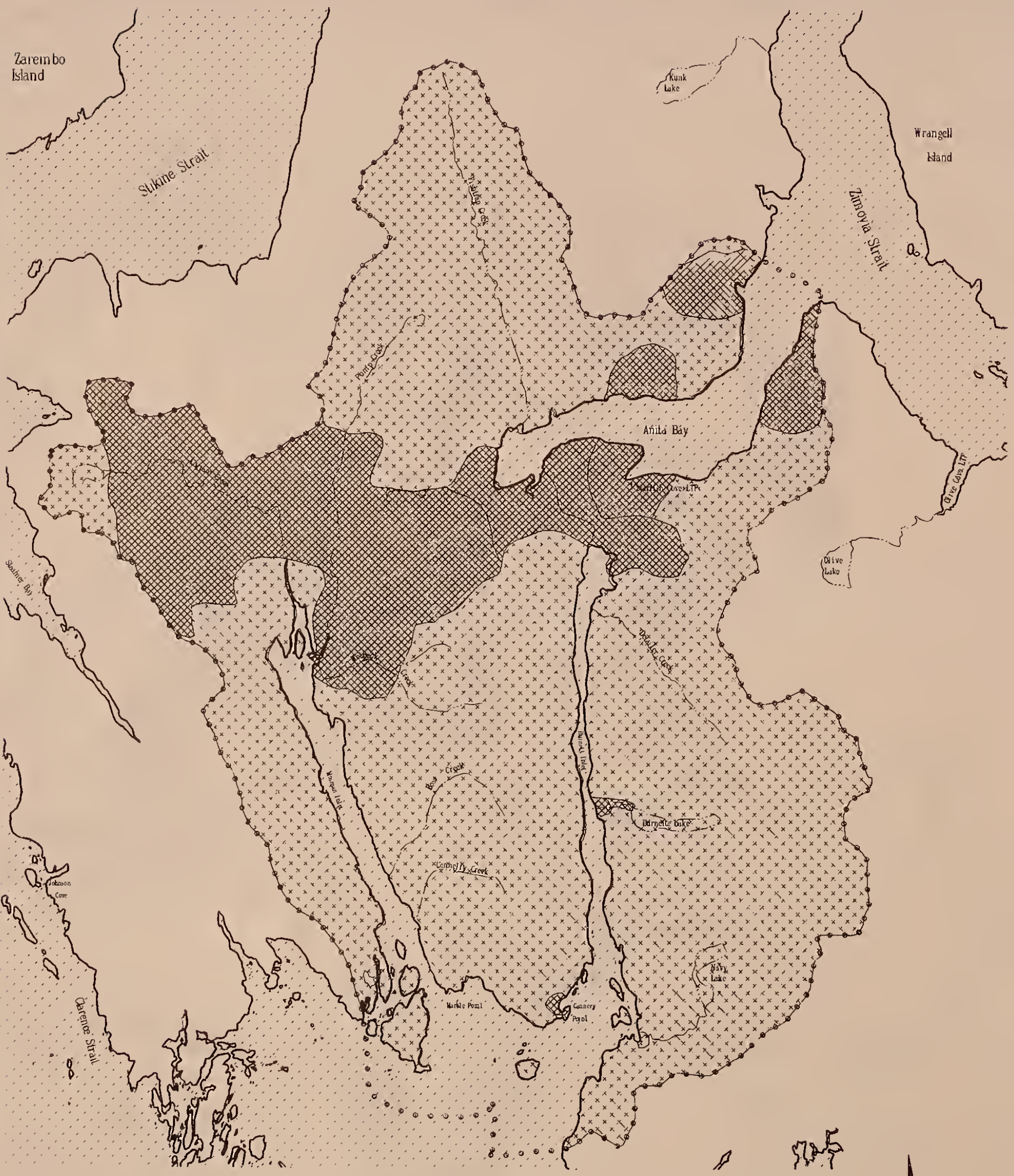
Soil mass movement is the dominant process of natural erosion in southeast Alaska. Many landslides occur during or immediately after periods of heavy rainfall, when soils are saturated. Particularly hazardous areas are steep slopes that have soils with distinct slip-planes, such as compacted glacial till or bedrock sloping parallel to the surface. These areas have a high likelihood of mass movement, especially if disturbed by blasting of rock pits or road pioneering, side casting of excavated material, or logging practices that cause substantial surface disturbance.

Vegetation, tree roots in particular, seems to have a stabilizing effect on slopes. Tree roots tend to decrease significantly in strength five to seven years after the tree is cut. This decrease in soil holding capability results in an increased likelihood of soil movement on steep slopes following clearcutting. Further, the displaced roots of uprooted trees can disturb the soil mantle whenever windthrow occurs. Under natural conditions, windthrow is an important triggering device of debris avalanches and flows in southeast Alaska.

Recent research on landslides in southeast Alaska (Swanston 1989) has concluded that although over 90 percent of all landslides in the past 20 years were not related to logging or roads, logging and roads do increase the potential for landslides in a given site.

A planning level stability analysis of the analysis area is based on the Soil Resource Inventory of Etolin Island. Landslide hazard classes are used to group soil map units that have similar properties regarding the stability of natural slopes. Three classes; high, moderate, and low; rank soil units according to their relative potential for mass wasting. Table 3-10 (page 3-33) shows the amount of each hazard class in the analysis area. Map 3-9 (page 3-32) shows the distribution of high hazard soils within the analysis area.

Map 3–8. Existing Visual Impacts



LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Visually Modified 23 percent
- Not Visually Modified 77 percent

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

N

Map 3- 9. High Hazard Soils

Table 3-10. Distribution of Soil Hazard Classes Within the Analysis Area

Soil Hazard Class	Acres	Percent of Area
Low	26,376	40%
Moderate	27,362	40%
High	13,393	20%
TOTAL	67,131	100%

Wetlands and Floodplains

The Etolin analysis area, like much of Alaska, has an abundance of wetlands. About 42 percent of the area is classified as wetlands. These include muskegs, estuaries, freshwater sedge meadows, forested wetlands, alpine wetlands, and freshwater lakes and ponds (see Table 3-11). The distribution of these wetlands is shown on Map 3-10, page 3-35.

There are 475 acres of floodplains within the analysis area; 370 acres of this is forested.

Table 3-11. Distribution of Wetlands Within Analysis Area

Wetland Type	Acres
Muskeg	11,583
Freshwater Meadow	104
Estuaries	103
Forested Wetland	7,129
Alpine Wetland	8,756
Lakes & Ponds	441
Total	28,116

Watershed

Drainage Basin Description

The Etolin Island analysis area includes portions of 75 watersheds whose streams terminate at saltwater, creating a watershed analysis area of about 57,400 acres. The Alaska Department of Fish and Game (ADF&G) has indicated that 19 of these 75 watersheds contain streams used by anadromous fish. These ADF&G watersheds total about 39,600 acres. Table 3-12 on the next page illustrates some of the characteristics of a few of the watersheds in the Etolin analysis area.

Table 3-12. Brief Descriptions of Some of the Etolin Analysis Area Watersheds

Watershed Name or Description	Area in Acres (sq. miles)	Total Stream Length (miles)	Drainage Density (mi./sq.mi.)
Logjam Creek	6685 (10.44)	23.19	2.22
Detailer Creek	2075 (3.24)	9.52	2.94
Pump Creek	5526 (8.63)	18.85	2.18
Smallest Watershed	29 (0.04)	0.19	4.16
Largest Watershed	6685 (10.44)	23.19	2.22
Smallest Drainage Density	264 (0.41)	0.63	1.52
Largest Drainage Density	133 (0.21)	1.54	7.43

These figures are determined from the Stikine Area GIS database. Drainage density is a measure of the total inventoried stream length in a basin divided by the basin area. Higher drainage densities indicate a watershed is more "dissected" than another, and therefore the risk that erosion processes will successfully deliver sediment to a stream channel is greater. On the Stikine Area, typical drainage densities range from less than one to greater than 10 miles per sq. mile, with a median value of 2.8. The Etolin watersheds have a median drainage density of 3.16.

These catchments receive a range of annual precipitation from 80 inches in coastal areas (mouth of Anita Bay) to in excess of 160 inches in the high elevation areas east of Burnett Inlet. Approximately 65 percent falls between September and February. Runoff processes produce average annual discharges on the order of 6 to 7 cubic feet per second (cfs) per square mile. Two-year peak flows of 110 cfs per square mile may occur, usually associated with intense October storms, or early spring rain-on-snow events. Summer low flows of one cfs per square mile are possible, but are not considered potential impediments to fish passage and spawning success. Stream temperatures are expected to remain within anadromous fish limits year-round.

Channel Classification

Stream channels on the Tongass National Forest have been classified and mapped using channel types--a physically based system which allows for comparing channels of similar form and function. A description of the physical characteristics and management considerations of the approximately 38 channel types is provided in *Channel Types Field Guide: A Guide to Stream Mapping Units on the Tongass National Forest Chatham Area* (R10-MB-6). Channel types have further been grouped by the stream processes which formed them, reflecting the long term interaction of geology, landform, climate, and resultant vegetation patterns. These process groups explain the basic interrelationships between the runoff, sediment transport, and vegetation patterns of channels so management guidelines and practices developed for each process group would consistently address the various management concerns of the different types of channels. For this level of timber sale project planning, process groups were further grouped according to two most basic management concerns. These include: 1). streambank stability--alluvial channels on floodplains and fans, and some portions of mixed-control channels; and 2). sideslope stability--V-notches of varying depth and other channels where streambank stability is less of a concern. For the management purposes considered here, a sideslope is that length of ground from the bankfull channel to the first major slope break above bankfull. The distribution of inventoried streams in the watershed analysis area is given in Table 3-13 on page 3-37.

Map 3-10. Wetlands

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Forested wetland
- Muskeg
- Esturine Alpine Meadow
- Freshwater Meadow
- Lakes and Ponds

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

N

Map 3-11. Watershed Boundaries

LEGEND

- Study Area Boundary
- Shoreline
- ADF&G ANADROMOUS STREAMS
- WATERSHED BOUNDARIES

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

N

The majority of streams are mostly stable, being well-contained in bedrock-controlled channels (80 percent; see Table 3-13). Some of these stable channels, however, are adjoined by unstable side slopes with a high risk of failure. Examples include steep slopes and V-notches, regardless of slope length. These channels are managed for sideslope stability. Also, despite their bedrock nature, local areas of stream banks may be quite sensitive to disturbance. Being contained, most of these channels can route higher flood flows without overtopping their banks. These streams are able to easily transport silt, sand, and material the size of large cobbles.

A smaller portion of streams (20 percent, Table 3-14) are alluvial, dependent on riparian vegetation and woody debris for stability, and sensitive to stream bank, stream bed, and floodplain disturbance. These channels include portions of the mainstem and valley tributaries located lower in the watershed, which are managed for streambank stability. Annual flows (a frequency of once per year) *may* go over stream banks onto floodplains, fans, and terraces, with the opportunity to both scour backwater or side channels and deposit sediment and nutrients. At higher flows these streams will easily move large gravels, as well as sand and silt particles.

Table 3-13. Distribution of Channel Type Process Groups on the Etolin Analysis Area (all watersheds, including those with ADF&G anadromous fish streams)

Managed For	Process Group	Stream Length (mi)
Streambank Stability	1. Low Gradient Floodplain[1]	13.2
	2. Alluvial Fan	2.9
	3. Mixed Control Moderate Gradient[2]	29.0
	7. Placid or Glide	2.8
	8. Estuary	2.3
		50.2
		= 20% of stream length
Sideslope Stability	4. Large Low Gradient Contained	4.9
	5. Moderate Gradient Contained	9.5
	6. High Gradient Contained[3]	181.6
		196.0
		= 80% of stream length

[1] **Low Gradient Floodplain** - These channels generally have a rich, abundant community of fish due to good spawning gravels and large wood for good rearing habitat.

[2] **Mixed Control Moderate Gradient** - These channels provide excellent rearing habitat due to large wood accumulations in the streams.

[3] **High Gradient Contained** - These are the smaller, steep, bedrock channels either at high elevation or draining directly into salt water. Fish use of these streams or tributaries is very low.

More detailed descriptions of the process groups can be found in Appendix D.

Map 3-11 (page 3-36) shows the watershed boundary map for the Etolin Island analysis area with only the ADF&G anadromous stream network. Map 3-12, opposite, shows the entire stream network grouped into two broad management concern classes, whether streambank stability, or sideslope stability.

Timber

The Etolin Island analysis area has undergone a recent inventory which included soil surveys, careful aerial photo analysis, and field verification. This information was combined to estimate the quantity of operable CFL on the area. Volume class and operablility determinations were based on the soil type, soil productivity, aerial photo analysis, and ground review.

The inventory was put into a computer database and used in this Etolin Island analysis. It is considered to be the most accurate and representative inventory available for the Etolin Island analysis area. Map 3-13 (page 3-40) shows the location of the total CFL based on the Etolin analysis inventory. Table 3-14 displays the comparison of total CFL to operable CFL acres by volume class and VCU.

Table 3-14. Comparison of Total CFL to Operable CFL Acres by Volume Class and VCU

VCU	Volume Class	Total CFL	Operable CFL
464 Anita	3	432	432
	4	4526	677
	5	4913	3145
	6	553	553
467 Mosman	3	1002	1002
	4	8263	2808
	5	5332	2747
	6	1150	1150
468 Burnett	3	77	77
	4	8604	2951
	5	4592	3512
	6	864	864
TOTALS		40,308	19,918

The Etolin Island analysis area is part of the coastal temperate rainforest. For a detailed description of the timber and vegetation characteristics, see the Southeast Alaska Area Guide, the Forest Ecosystem of Southeast Alaska (Volumes 7 and 9), Preliminary Forest Plant Associations of the Stikine Area, and the Final Environmental Impact Statement for the Tongass Land Management Plan.

Map 3-12. Stream Network

LEGEND

- Study Area Boundary
- Shoreline
- MANAGED FOR SIDESLOPE STABILITY
- MANAGED FOR STREAMBANK STABILITY
- LAKES

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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Map 3–13. Total CFL

The Etolin Island analysis area covers approximately 67,131 acres. The area is composed of approximately 14,213 acres of nonforested land and 52,918 acres of forested land. Of this forested land, approximately 12,610 acres are noncommercial forest and 40,308 acres are commercial forest land. The commercial forest contains approximately 20,390 acres of inoperable commercial forest, which is not available for timber harvest. The remaining 19,918 acres of operable commercial forest are available for timber harvest.

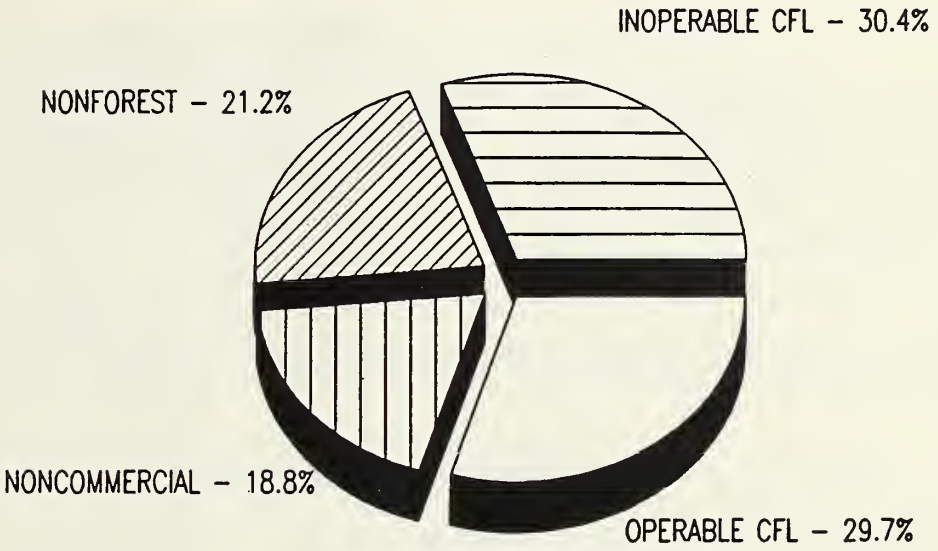


Figure 3-2. Land Base

The Etolin Island analysis area has large expanses of poorly drained low productivity forested sites which can not sustain commercial forest volume. The sites which can produce commercial forest timber have a moderate timber productivity. Generally, the Etolin area has low- to medium-volume timber stands on low- to moderately-productive growing sites. The higher volume stands are located on the better drained sites along the streams and on the steeper mountain slopes. The lower volume stands occur on the poorly drained sites and at the highest elevations. Indices used in southeast Alaska for measuring site productivity are site index and volume class. The Farr's 50 year site index calculated from the soil inventory shows that approximately 11 percent of the commercial forest land has a high site index (greater than 90). Approximately 63 percent has a moderate site index (70-90), and 26 percent has a low site index (50-69).

Approximately 13 percent of the operable commercial old growth forest land is volume class 6 (30-50 mbf per acre), 47 percent is volume class 5 (20-30 mbf per acre), 32 percent is in volume class 4 (8-20 mbf per acre) and 8 percent is in volume class 3 (second-growth, less than 8 mbf per acre).

Table 3-15 displays the volume class distribution of the operable commercial old growth forest land by acreage. Table 3-16 displays the volume class distribution of the operable commercial old growth forest land by million board feet (MMBF) of timber volume.

Table 3-15. Acres of Operable Old-growth CFL by Volume Class

Management Area	VCU	Volume Class 3	Volume Class 4	Volume Class 5	Volume Class 6	Total VCU
S23	464	432	677	3145	553	4807
	467	1002	2808	2747	1150	7707
	468	77	2951	3512	864	7404
Totals		1511	6436	9404	2567	19918

Table 3-16. Timber Volume (MMBF) on Operable Old-growth CFL by Volume Class

Management Area	VCU	Volume Class 3	Volume Class 4	Volume Class 5	Volume Class 6	Total VCU
S23	464	--	11	76	18	105
	467	--	40	67	35	142
	468	--	41	86	27	154
Totals		--	92	229	80	401

Commercial forest species include Sitka spruce, western hemlock, Alaska-cedar, western redcedar and mountain hemlock. Noncommercial forest species include lodgepole pine and alder.

The commercial forest stands on the area occur predominately as uneven-aged and over-mature old growth stands. A minor component of the commercial forest exists as even-aged stands of varying ages. These even-aged stands originated from timber harvest or from natural catastrophic windstorms.

The old-growth commercial forest has a general species composition averaging 60 percent hemlock, 17 percent Sitka spruce, and 13 percent Alaska cedar, and 10 percent redcedar. The species composition varies somewhat between the volume classes.

The old-growth forest stands are beyond the culmination of mean annual increment and have a high proportion of dead and dying trees. Wood defect and decay are estimated to effect up to 30 percent of the volume. Dwarf mistletoe is present on hemlock in most of the old-growth stands. Alaska-cedar mortality is present on the area and is part of the Alaska-cedar decline currently occurring throughout southeast Alaska.

Approximately 8 percent (1,511 acres) of the operable commercial forest land on the analysis area has been converted to second growth. All of the second growth stands have been certified as adequately stocked. The second growth stands exhibit vigorous growth and have a stocking range from a well stocked to overstocked condition. Of the 1,511 acres of second growth, 680 acres have had silvicultural treatments to improve stand characteristics for timber and other resources. These treatments were 163 acres of burning, 441 acres of planting, and 76 acres of thinning.

Employment

The timber and fishing industries provide the majority of all jobs in the primary employment sector in southeast Alaska. A number of near-by communities could be affected by a timber sale in the area. In Wrangell, timber harvest and milling are the primary employers, followed by Federal, State, and local government, and seafood harvesting and processing. The Alaska Pulp Corporation sawmill is the town's largest employer, and tourism is an emerging industry. Ketchikan is the State's fourth largest city. Its economy, too, is based on timber, fishing, and tourism. In Meyers Chuck, most of the residents fish for a living. Thoms Place is a small settlement that is also dependent on fishing.

Transportation

The transportation system on Etolin Island evolved entirely from the harvest of timber products. Timber harvest and related National Forest management activities are the sole purpose of road development and management. The transportation system on Etolin Island is not linked to the inter-island transportation network of the Alaska Marine Highway system. Consequently, no recreational automobile traffic has occurred and none, other than the occasional off-road vehicle, is expected.

There is an opportunity to link the existing road system in VCU 464 (Anita) to the existing road system in VCU 469 (Olive).

There are 23.2 miles of Forest Development Road within the analysis area. There are an additional 10.5 miles of Forest Development Road in the VCUs adjacent to the analysis area.

Table 3-17. Existing Forest Development Road by VCU

VCU Number	Location	Length (Miles)
464	Anita	6.8
465	Quiet	3.1
467	Mosman	14.6
468	Burnett	1.8
469	Olive	7.4
Total		33.7

Log Transfer Facilities

There is one existing log transfer facility (LTF) within the analysis area, located on the south shore of Starfish Cove, Anita Bay. This LTF was originally designed and constructed in 1983 for the Granite Timber Sale as a treated timber bulkhead with an A-frame lift-off system. The LTF was reconstructed in 1985 to a steel H-pile and timber bulkhead with a crane lift-off system and is currently scheduled for additional repairs to increase the loading capacity on the bulkhead for larger cranes. Approximately 53 MMBF feet of timber has passed over this facility.

Camps and Administrative Sites

There is one land-based logging camp and Forest Service administrative site at Anita Bay. The camp is inactive at this time. There is a native log barge loading/unloading facility and air-taxi and boat dock on the north shore of Starfish Cove associated with this camp.

Chapter 4

Environmental Consequences

Introduction

The purpose of this chapter is to describe the physical, biological, economic, and social effects likely to result from each alternative. A summary of the consequences of each alternative is displayed in Table 2-2 at the end of Chapter 2. The information has been taken from more detailed reports that are available for public review in the planning record, located at the Forest Supervisor's Office, Petersburg, Alaska.

Adverse Environmental Effects Which Cannot Be Avoided

There are some adverse effects which cannot be avoided if one of the action alternatives is selected.

Harvest in the Etolin analysis area would reduce the number of old-growth stands. As a result, the carrying capacity of the habitat will be reduced for old-growth-dependent species.

Ground disturbing activities such as stream crossings and culvert installation will temporarily increase silt loads in streams and tributaries within the analysis area. In addition, a small loss of fish habitat will occur at road crossings in those portions of fish habitat occupied by culverts.

Timber harvest and road construction will change the appearance of the landscape. The area where change will be most noticeable is from Anita Bay and near the head of Mosman and Burnett Inlets. The effects will diminish when the vegetation grows back.

Short-Term Use Versus Long-Term Productivity

One of the major benefits of timber harvest is the increased growth rate of the new trees (regeneration). In old growth climax stands, annual growth is offset by mortality so that net growth is zero (Hutchison and Labau 1975). In contrast, young-growth stands will produce, on a 100-year rotation on an average site, about double the cubic foot volume maintained in most old-growth stands (Taylor 1934). Each action alternative would improve the production of merchantable timber by converting old-growth climax stands to highly productive, even-aged, young-growth stands. In addition, production of merchantable wood can be further increased if, after the site is harvested and regenerated, the new stands are precommercially thinned.

Irreversible Loss of Resources

An irreversible loss is a permanent or long-term use of a resource that is not replaceable within a lifetime, including the destruction of a cultural site or consumptive use of minerals. In the Etolin analysis area, for example, cultural artifacts and cultural sites could be irreversibly disturbed as a result of the timber sale. Subsurface cultural sites that cannot be located with surface surveys are especially vulnerable. The harvest of old-growth timber within the Etolin analysis area is also an irreversible loss because the stands may take 200 to 300 years to develop and the commitment of this resource to timber harvest is reversible only over a long period of time.

Irretrievable Commitment of Resources

An irretrievable commitment is a decision that makes other choices unavailable during the life of the commitment. The decision cannot be retrieved for the time that has already passed, but could be changed in the future.

Timber harvest and road construction would irretrievably remove the opportunity to use those parts of the Etolin analysis area for primitive, unroaded recreation until the vegetation grows back. The construction of roads and the establishment of rock pits is also considered an irretrievable commitment that would reduce or eliminate soil productivity on those sites unless they are rehabilitated. The establishment of buffer strips around eagle nest trees, around cultural sites, and within Aquatic Habitat Management Units (AHMUs) makes these buffer areas unavailable for timber harvest.

Wildlife

Four measures of consequences resulting from implementing the proposed alternatives are:
A) Acres harvested by habitat type for each alternative; **B)** Percentage of high quality habitat remaining for Sitka Black-tailed Deer, Bald Eagle, Black Bear, Marten and River Otter (referred to collectively as MIS); **C)** Population numbers of MIS that the habitat is theoretically capable of supporting, and the effect on population viability, subsistence harvest and sport harvest; and **D)** Number and size of forested blocks remaining for ecosystem viability and productivity.

The effects of implementing the proposed alternatives will be addressed for consequences A through D. Consequence A represents wildlife habitat retention acres, assumed to remain unharvested throughout the scheduled 100 year rotation. Consequence D, effects on maintaining large blocks of old growth habitat, is an immediate effect which will design landscape management for future planning periods. Consequences B and C will be displayed for four moments in time to address cumulative impacts. The time periods are: 1954 (natural condition); 1990 (existing situation); 1991-2015 (alternative implementation); 2091 (one hundred years after implementation).

Habitat harvested

Consequence A: Acres harvested by habitat type for each alternative. The Habitat Capability models indicated that the most productive habitats in order of priority were estuary, beach, and riparian. Acres within these habitat types were selected to represent retention acres. All of the proposed alternatives included these retention acres, which include a 1000 foot buffer around estuaries, a 500 foot strip of beach fringe, and a buffer zone no less than 100 feet in width on each side of all Class I and Class II streams. (The difference between alternatives in acres harvested in riparian habitat includes variable amounts of timber harvested along Class II streams.) Table 4-1 displays the number of acres proposed for harvest within estuary, beach and riparian ecosystems.

Table 4-1. Summary of Acres Harvested by Habitat Type for Each Alternative

Alternative	Estuary	Beach	Riparian	Forest
1	0	0	69	1736
2	0	0	70	1922
3	0	0	70	1614
4	0	0	61	1659
5	0	0	0	0

High Quality Habitat Remaining

Consequence B: Percentage of high quality habitat remaining for Sitka black-tailed deer, bald eagle, black bear, marten and river otter. These species are referred to collectively as Management Indicator Species (MIS). Quality of habitat was defined for each MIS using the Draft Habitat Capability Models (USDA Forest Service, 1988-1990). The highest quality habitat was identified by acres receiving the highest Habitat Suitability Index (HSI) value. Cumulative impacts on high quality habitat are projected over the four time scenarios and displayed in Appendix A (Q1-3).

This analysis recognizes that lands within this analysis area are for the most part allocated for timber production and that most of the operable commercial forest lands, less retention acres, will be harvested by the end of the planned 100 year rotation. The cumulative impacts of implementing alternatives 1 through 4 will eventually result in the projected amount of quality habitat displayed in the 100-year scenario.

Population Numbers

Consequence C: Population numbers of MIS that the habitat is theoretically capable of supporting, and the effect on population viability, subsistence harvest and sport harvest. Population numbers were determined by multiplying the maximum populations of MIS (documented to occur in southeast Alaska) by the number of habitat acres and the HSI value per acre that the Habitat Capability Models assigned. Optimum deer winter habitat can support 125 deer per square mile (640 acres) during a mild winter. The acres of habitat receiving a HSI value of 1.0 were assumed to represent optimum deer winter habitat and therefore had the capability of supporting 125 deer per square mile. It would take 2,560 acres of habitat with a HSI value of 0.25 to support 125 deer during a mild winter. Caution should be used when referring to these population numbers because they are "theoretical" predictions based on the model assumptions. The assumptions do not include factors such as nutrition, disease, accidents, predation, accessibility between habitat patches, etc.

Cumulative impacts on populations of MIS were projected for the four time periods and displayed in Appendix A (P1-4).

This analysis recognizes that lands within this analysis area are for the most part allocated for timber production and that most of the operable commercial forest lands, less retention acres, will be harvested by the end of the planned 100-year rotation. The cumulative impacts of implementing alternatives 1 through 4 will eventually result in the projected populations of MIS displayed in the 100-year scenario.

Viable Populations

The National Forest Management Act directs that "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. A viable population is one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well-distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well-distributed so that those individuals can interact with others in the planning area (CFR 219.19)." Retention acres, representing the highest quality habitat for the MIS, are assumed to provide adequate habitat to maintain viable populations. Alternatives 1 through 4 comply with this direction based on the following information available from an interagency task force group (Tongass Land Management Plan Revision, DEIS, 1990).

Sitka black-tailed deer. Alaska Department of Fish and Game "wildlife analysis areas (WAA)" were identified as geographic units that would recognize and take into account the distribution and dispersal of deer among the islands of southeast Alaska. Within each WAA (see Map 3-1 at the beginning of Chapter 3) the task force recommended maintaining adequate habitat to support 500 animals to achieve a well-distributed population and to maintain population viability within the planning area. The analysis area is a small portion of WAA 1901. The projected deer population numbers for just the analysis area, regardless of alternative selected during this planning period, will be 987 animals at the 100 year projection.

River otter. Research in southeast Alaska indicates that all river otters use coastal habitats at some time during the year, with a portion of the populations using freshwater habitat during various seasons of the year. To achieve a well-distributed population and to maintain population viability within the planning area, the task force recommended maintaining adequate habitat to support at least one otter per 4.4 miles of coastline within each geozone. Etolin Island has 223 miles of coastline; therefore, a viable population for this geozone would be 50 animals. The projected otter population numbers for just the analysis area, regardless of alternative selected during this planning period, will be 53 animals at the 100 year projection.

Black bear. Due to their population densities and large home ranges, maintaining viable populations of black bear requires large units of land. To maintain black bear populations well-distributed within their occupied range, seven geographic units were identified using Alaska Department of Fish and Game Management Units. Game Management Unit 3, which includes Etolin Island, will need to maintain habitat to support 125 animals. The projected bear population numbers for just the analysis area, regardless of alternative selected during this planning period, will be 82 animals at the 100 year projection.

Marten. To maintain populations "well-distributed" within their occupied range on the islands, Alaska Department of Fish and Game wildlife analysis areas (WAA) were identified as geographic units that would recognize and take into account the distribution of marten among the islands of southeast Alaska. Within each WAA, the task force recommended maintaining adequate habitat to support 50 animals to achieve a well-distributed population and to maintain population viability within the planning area. North Etolin Island, primarily WAA 1901, will need to maintain adequate habitat to support 50 marten. The projected marten population numbers for just the analysis area, regardless of alternative selected during this planning period, will be 101 animals at the 100 year projection.

Bald eagle. Using data from the Pacific Bald Eagle Recovery Plan, an interagency task group recommended that the smallest population of bald eagles which would be considered viable for southeast Alaska would be the following: a minimum of 800 nesting pairs with an average reproductive rate of 1.0 fledged young per pair, with an average success rate per occupied site of not less than 65 percent. The group also recommended that a minimum one-half mile long by 500 footwide old-growth beach fringe zone would need to be maintained for nest sites for each of the 800 pairs. To maintain the bald eagles well-distributed within their occupied range, the task group recommended that the 800 nesting pairs would need to be distributed in the same proportion as the existing nest distribution within each of the geozones. The retention acres represent a continuous beach zone 500 feet wide maintaining virtually 100 percent of the bald eagle habitat in the analysis area.

Deer and Marine Mammal Subsistence Harvest

The communities of Wrangell, Petersburg and Point Baker are active subsistence harvesters of marine mammals and deer within the analysis area.

The proposed alternatives will have little, if any, impact on the populations of marine mammals. There are no additional log storage dumps proposed. The impact on harvest would likely be short-term and would take the form of competition from households temporarily located in the logging camp.

The proposed alternatives will reduce the deer population within the Analysis Area as indicated in Appendix A, P1. The projected deer population within the analysis area (regardless of alternative selected during this planning period) will be 987 animals at the end of the planned 100 year rotation. Assuming that the analysis area deer population contributes 20 percent toward maintaining viable populations in WAA 1901, habitat will remain at the end of the 100 year rotation to support 790 deer. The following information indicates the importance of deer in the annual subsistence harvest for the three communities.

Wrangell. Wild game and fish provide 23 percent of the household food supply for Wrangell residents. The annual harvest of subsistence resources was about 165 pounds per person in 1987, including shellfish (25 percent), salmon (18 percent), and other finfish (26 percent). An assumption was made that deer subsistence harvest contributed the majority of the remaining 31 percent. According to TRUCS maps, the analysis area contains deer hunting areas considered "most reliable" and "most often used" by the Wrangell Community.

Petersburg. Deer was by far the major component of subsistence harvest in Petersburg, providing 22 percent of the total harvest. The average household harvest was 145 pounds with a mean per capita of 44 pounds (Smythe, 1988). According to TRUCS maps, the analysis area contains "areas ever hunted" for deer by the Petersburg community.

Point Baker. A sample of Point Baker households reported an average of 345 pounds of edible meat and fish harvested per capita in 1987 (TRUCS Community Profiles, 1988). Deer contributed 93 pounds to the total per capita harvest. According to TRUCS maps, the Analysis Area contains "areas ever hunted" for deer by the Point Baker community.

Subsistence and Sport Harvest Projections

Assuming that the demand for sport hunting on Etolin Island increases 100 percent in the next 100 years, this would double current harvest records to 60 deer for all of Etolin Island. The Habitat Capability Models predict that habitat remaining after the planned 100 year rotation will be capable of supporting 790 deer.

Forested Blocks

Consequence D: Number and size of forested blocks remaining for ecosystem viability and productivity. In the early 1970s, the Forest Service adopted a practice of staggered settings that results in a regular pattern of clearcuts and equal sized leave strips between units. When viewed from the individual stand level this harvest pattern maximized edge habitats to the benefit of many gamebirds and big game species, and creation of edge was, and remains, a game management habitat objective.

A recent broader perspective of wildlife ecology has recognized that a group or guild of wildlife prefers forest interior conditions not affected by openings or abrupt ecotone edges created by forest management. Recent research has demonstrated that edge effects may extend up to 2 to 3 tree heights into the forest stand. Area-sensitive species respond negatively to edge habitats and may require a minimum size habitat patch that retains forest interior conditions. Most notable among the group of area-sensitive species are the neotropical migrant forest nesting songbirds.

When viewed at a larger scale of aggregation of stands within an entire watershed, staggered setting harvest techniques have fragmented many forest landscapes, thus minimizing the availability of forest interior habitats. Simulation studies have demonstrated that when as little as 50 percent of the forest in a watershed has been harvested under the staggered setting regime, little if any forest interior habitat conditions remain. This management system could have negative consequences to maintenance of biodiversity.

On the Tongass National Forest, several Management Indicator Species proposed for the Revision of the Tongass Land Management Plan may be sensitive to forest fragmentation and may require minimum patch sizes to achieve 100 percent habitat effectiveness (Table 4-2). In addition, several species that occur on the Tongass National Forest were found in a northern California study to be either sensitive to fragmentation (e.g. sharp-shinned hawk and blue grouse) or were rarely detected along edge habitats (e.g. brown creeper, golden-crowned kinglet, and Townsend's warbler).

In addition to the potential for abrupt edge to reduce wildlife habitat suitability, there are other negative consequences of harsh edge. The zone of edge influence that can extend 2 to 3 tree heights into the forest stand has the potential to disrupt old growth functional processes through modifications in wind, temperature, humidity, and light regimes naturally occurring in relatively stable old growth systems. Finally, edge created by clearcutting harvest systems exposes a forest stand to increased susceptibility to windthrow in high risk landscape positions.

Table 4-2 displays estimates of minimum old growth patch size necessary to achieve 100 percent habitat effectiveness for proposed Management Indicator Species identified as potentially sensitive to habitat fragmentation. Estimates are also provided for two additional species occurring in southeast Alaska that may also be area sensitive (Analysis of the Management Situation, Tongass National Forest Land and Resource Management Plan Revision- R10-MB-89).

Table 4-2. Estimates of Minimum Old Growth Patch Size

Management Indicator Species	100% Effective Patch Size (acres)
Sitka black-tailed deer	1000
Hairy woodpecker	500
Red breasted sapsucker	250
Marten	180
Red squirrel	30
Brown creeper	15
Goshawk	2500
Marbled murrelet	600

Forest Block Selection

Individual drainages within the analysis area represent unique ecosystems. Existing clear cuts, proposed harvest units, muskeg, subalpine and beach were used as boundaries to define forest blocks remaining after harvest. A minimum block size of 1000 acres was selected to represent wildlife species which are sensitive to habitat fragmentation. The greatest number of forest blocks and the larger forest blocks would provide for greater viability and productivity within the analysis area. Table 4-3 displays the difference in numbers of forest blocks, location of blocks, and size of blocks. The average size of the existing forest blocks is 2380 acres. Average forest block size maintained differs considerably by alternative. In the long term perspective, there is little difference between alternative selection if land allocations and rotation ages are maintained for the next 100 years. However, in the near term, maintenance of large blocks of old growth in Alternative 4 maintains a broader array of landscape management options for future land management planning.

Table 4-3. Forest Blocks Remaining by Alternative

Alternative	Number of Forested Blocks	Location of Forest Blocks	Acreage of Forest Blocks	Average Block Size
1	4	Fishtrap NW Mosman Connelly Creek to Marble Point Starfish	2400 890 2550 1200	1760
2	4	Fishtrap Detailer Pump Creek Starfish	500 220 390 1200	578
3	4	NW Mosman Detailer Wetbeck Creek to Marble Point Starfish	970 500 4890 1200	1890

Table 4-3. Forest Blocks Remaining by Alternative (continued)

Alternative	Number of Forested Blocks	Location of Forest Blocks	Acreage of Forest Blocks	Average Block Size
4	5	Fishtrap NW Mosman Detailer Wetbeck Creek to Marble Point Starfish	1680 950 1480 5070 1800	2196
5	6	Fishtrap NW Mosman Wetbeck Creek to Marble Point Detailer Starfish	2400 1150 5070 1480 1800	2380

Fisheries

General

It has been extremely difficult to determine specific cause-and-effect relationships between some forest management practices and variations in salmonid populations. Wild, unmanipulated populations have been found to vary naturally as much as fifty percent due to climatic conditions, escapement, predation, and other variables. Some land management activities can result in masking some effects while compounding others, making it difficult to predict simple cause and effect in order to estimate quantitative changes in fish populations. However, various studies have determined some general and basic needs of the different life stages of salmonids which require controlling management activities to reduce the potential for adverse impacts on fish populations.

The three primary deleterious effects that timber harvest and associated road development can have on fisheries are 1) contribution of sediment to streams from mass wasting and erosion of road surfaces and exposed soil; 2) expansion of the extremes in water temperatures due to canopy removal; and 3) removal of future sources of large woody debris by harvesting riparian trees.

Sedimentation

High levels of deposited sediment can cause decreased survival of salmonid eggs and alevins by reducing water flow through the streambed gravel, thereby suffocating the eggs or preventing the hatched alevins from emerging. Extremely high levels of sedimentation may also reduce available habitat for fish by filling pools and interstitial spaces in the streambed. Water turbidity has been found to cause a decrease in feeding rate and a greater tendency to leave holding lies and migrate downstream.

Roads contribute sediment to streams by two primary pathways: mass failures or surface erosion. Mass failures are a part of the natural land-forming process. Acceleration of these events by management activities can be greatly reduced by avoiding those areas known to be prone to failure.

Factors affecting sedimentation by surface erosion include construction technique, road gradient, surface area, type of surfacing material, and traffic volume. The filtering capabilities of small streams play a very important role in determining the impact of road sediment on aquatic resources. Drainage points which discharge water and suspended sediment onto the forest floor distant from a defined channel contribute very little sediment load to streams.

Water Temperature

Although a limited increase in water temperature can be beneficial to fisheries in certain situations, great care must be exercised to consistently achieve the desired effect. Canopy removal adjacent **riffle** sections can result in an increased level of fish food production due to increased sunlight penetration. Removal of streamside canopy adjacent **pools** can elevate the average temperature of these low-velocity feeding and resting areas in summer and decrease the average temperature in winter. Canopy removal adjacent **spawning areas** between pools and riffles can result in a number of effects, some desirable, some not, depending on the species, life history stage, and the effect itself, the worst of which could be the lowering of water temperatures to the point of developing anchor ice in the gravels where the eggs are developing.

Large Woody Debris Recruitment

Maintenance of the riparian canopy can be critical to ensuring a future source of (1) large woody debris (LWD) which provides structure for in-stream habitat, retaining nutrient-rich fish carcasses and leaves, and maintaining the integrity of channel structure and function, (2) shade for temperature-sensitive streams, and (3) a source of carbon for the stream energy budget.

Buffers

The Tongass Timber Reform Act of 1990 prohibits the commercial harvest of timber within a buffer zone of no less than one hundred feet in width on each side of all Class I streams and those Class II streams which flow directly into a Class I stream. The retention of a buffer zone is a management practice/prescription used to reduce risk to fisheries (and other wildlife). However, buffers are not without risk themselves, as they are subject to windthrow. A windthrown buffer has greater potential to cause even more severe damage to fish habitat than canopy removal, depending on channel type and fish species affected. To be effective in moderating stream temperatures and providing a future source of LWD, a buffer must be configured so as to be wind-firm. This is often accomplished by locating the length of the buffer parallel to the prevailing direction of storms and/or extending the buffer to a windfirm topographic boundary.

Risk

Consequences are measured by the degree to which there is a potential for damage to or loss of the resource. Recognized prudent management activities or Best Management Practices (BMPs) (refer to R-10 Soil and Water Conservation Handbook, FSH 2509.22) are employed to eliminate direct effects and to reduce the risk of indirect effects to the greatest extent practicable within the context of management goals as defined by law, regulation, and administrative decision. In addition, the R-10 Aquatic Management Habitat Handbook (FSH 2609.24) provides state-of-the-art guidance for developing riparian management prescriptions to minimize water quality degradation and, subsequently, the risk to fisheries which would be presented by implementation of any of the action alternatives.

Crude measures of ***relative***, not absolute, ***risk*** to fisheries include total length of roads, total number of stream crossings, total length of buffered and unbuffered stream channel, and total acres of harvest within fish stream watersheds. Combined, these relative risk factors provide a means of comparing development alternatives with regard to potential impact on fisheries.

4 Environmental Consequences

Existing Risk Common to All Alternatives

Due to past development activities, there remains existing risk in 9 of the 22 Class I fish stream watersheds, and 1 of the 8 Class II fish stream watersheds. Within these 10 fish stream watersheds, there exist 26 miles of road having 35 associated stream crossings as well as 1490 acres of existing clearcuts. Associated with these existing clearcuts are 6 miles of unbuffered and 2 miles of buffered stream channels.

Comparison of Alternatives

The alternatives are compared for their relative contribution of risk to fisheries in Figure 4-1, Fish Risk Factors. The information represented in the graph relates to activities past, proposed, and cumulative, within fish stream watersheds only, i.e., watersheds possessing streams that are known or expected to be inhabited by salmon or trout.

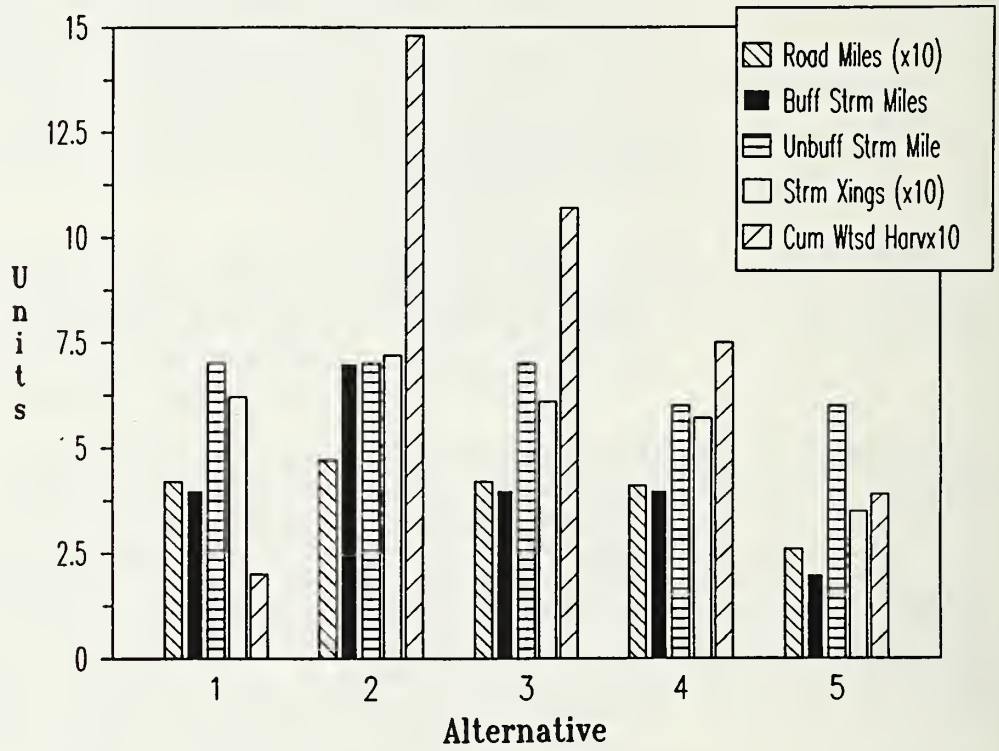


Figure 4-1. Fish Risk Factors

Interpreting Figure 4-1:

Alternative 1 would present risk, in terms of total existing and proposed amount of unbuffered fish streams, equivalent to Alternatives 2 and 3.

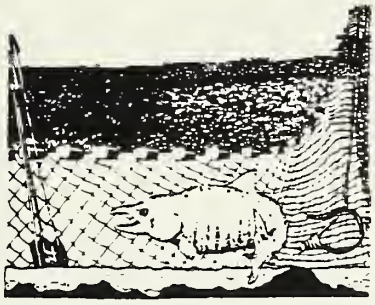
Alternative 2 would pose the greatest overall potential threat to fisheries in terms of the number of Class I and II watersheds entered and total existing and proposed road miles, stream crossings, and percent watershed harvest. This alternative appears, from the data presented, to be the least desirable choice, among action alternatives, in terms of potential impacts to fisheries.

Alternative 3 would present the least risk in terms of total existing and proposed streamside buffers.

Alternative 4 would pose the least potential impact to fisheries in terms of the number of Class I and II watersheds entered and total existing and proposed road miles, stream crossings, percent watershed harvest, and unbuffered fish streams. The risk presented by existing and proposed streamside buffers is only slightly greater than that presented by Alternative 3. This alternative appears, from the data presented, to be the most desirable of the action alternatives with respect to minimizing risk to fisheries.

Subsistence

For the most part, consequences of the alternatives to subsistence fish harvest is directly related to the relative risk of the alternatives to fisheries habitat. Little, if any, impact on the populations of marine species is expected. Impact on harvest would likely be short-term and would take the form of competition from households temporarily located in the logging camp. However, the opportunity for harvest would remain and, in fact, would be expanded with the extension of the road system.



RECREATION

A number of consequences are common to all of the action alternatives:

1. The character of some recreation opportunities would change from undeveloped and primitive to modified and motorized. This is consistent with the area's LUD III & IV status. (See Table 4-4 on the next page for changes in recreational opportunity.)
2. The construction of additional roads would provide easier access for subistence use, sport hunting, hiking, sport fishing, and for other recreation opportunities within parts of the area.
3. The carrying capacity for old-growth-dependent species would decrease, and with it, the likelihood of hunting success.
4. Motorized recreation opportunities would increase with the additional miles of roads constructed.

Alternative 5, the no action alternative would leave the existing mix of recreation opportunities unchanged. The analysis area would remain primarily unmodified (see Table 4-4). Motorized access and use would continue to be primarily along the existing roads and from the surrounding saltwater.

Alternatives 1, 3 & 4 would all build about the same amount of new road. Alternative 1 provides increased access south along Mosman Inlet. Alternative 3 & 4 provide new access along Fishtrap Creek but not south along Mosman Inlet. Alternative 2 builds the greatest amount of new road, providing access south along Mosman Inlet to Marble Point and along Fishtrap Creek.

Alternatives 1, 3 and 4 would all change the recreation opportunities in much the same way (see Table 4-4). They would all convert about the same amount of the recreation opportunities to Roaded and Modified. Alternative 2 would convert the greatest area to a Roaded-Modified recreation opportunity (see Table 4-4).

Cumulative Effects

All of the action alternatives would provide greater access to the area and shift the nature of the recreation experience from Primitive to Roaded Modified. The area would probably be used more than in the past for recreation purposes.

Table 4-4. Changes in Type of Recreational Opportunity.

RECREATION	ACRES PER ALTERNATIVE				
OPPORTUNITY	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Primitive	7,054	7,054	7,054	7,054	13,484
Semi-Primitive, Non-Motorized	20,297	15,012	19,840	20,585	22,618
Semi-Primitive, Motorized	15,606	15,164	16,797	16,753	19,538
Roaded Modified	24,174	39,801	23,440	22,739	11,491

CULTURAL RESOURCES

Cultural resource sites within the analysis area may contain significant information on past environmental conditions and human lifeways, possibly including information related to past conditions along the north Pacific Rim. These sites are both fragile and non-renewable. Primary impacts can include alteration to the settings of sites; alterations of above ground objects, features and structures; as well as the spatial relationships among them; and disturbance or destruction of subsurface cultural deposits. Secondary impacts may include a higher frequency of site vandalism due to increased access from constructed roads.

Federal laws and regulations (particularly the National Historic Preservation Act of 1966, as amended; Executive Order 11593; and the American Indian Religious Freedom Act of 1978) require a process, specified in 36 CFR 800, for considering the impacts of Federal projects on cultural resources. In brief, this process outlined in Section 106 of the National Historic Preservation Act, involves inventorying the resources, determining which are significant or eligible for inclusion on the National Register of Historic Places, evaluating project effects, and designing and implementing measures to negate any adverse effects that projects may have upon significant resources. The process is undertaken in consultation with the Alaska State Historic Preservation Officer (SHPO) and possibly the Advisory Council on Historic Preservation.

The known sites in the analysis area are surrounded by protective buffer strips and will not receive impact. It is more difficult, however, to predict the effects on sites that have not yet been identified. Ground disturbing activities can damage these sites. The area of ground disturbance in each alternative is displayed in Table 4-5.

Table 4-5. Ground-Disturbing Activities

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Road Miles	26	35	26	25
Acres of Possible Ground Disturbance (Timber Harvest Areas)	2177	2261	2314	2046

Generally, those alternatives which favor more development pose a greater threat to undiscovered cultural resources. An examination of Table 4-5 indicates that Alternative 3 offers the greatest chance of damaging undiscovered sites, followed in descending order by Alternative 2, Alternative 1 and Alternative 4. The No Action Alternative by its very nature would constitute the least threat to cultural resources.

This assessment differs, however, when the location of ground disturbance is compared to the Tongass National Forest cultural resource probability model. A set of environmental variables (elevation, slope, etc.) is utilized to predict a high, medium or low probability for cultural resources. Generally, all ground disturbance within the high and medium probability zones is targeted for an intensive field inventory. When ground disturbance is placed within the context of the cultural resource probability model Alternative 4 poses the greatest threat to cultural resources, followed in descending order by Alternative 3, Alternative 1 and Alternative 2.

Table 4-6. Cultural Resource Probability Zones

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Acres in High Probability Zone	362	155	630	362
Acres in Medium Probability Zone	518	602	378	754
Acres in Low Probability Zone	1298	1504	1307	931

Before logging and other ground disturbing activities are undertaken in the selected alternative, Forest Service personnel will apply the probability model to inventory cultural resources. The Forest Service will evaluate the significance of any discovered cultural resources, determine potential project impacts and design and implement necessary specific measures to negate any effect on significant cultural resources. Such measures could include relocating or redesigning some timber management activities to avoid disturbing cultural resources, protecting sites through the use of physical barriers, and recovering scientific data or otherwise documenting sites that can not be avoided or protected. An inventory strategy and mitigation measures will be designed in consultation with the Alaska SHPO to negate adverse project effects on significant cultural resources.

Cumulative Effects

Impacts from decay, natural landscape changes and development pose a threat to the preservation of significant cultural resources in the analysis area. Future timber development combined with other ground disturbing activities could result in a loss of cultural resources. Because little inventory has been conducted in the analysis area, it is impossible to determine the exact number and nature of cultural resources that are potentially threatened by future development. Implementation of field inventories and various mitigation measures will reduce the potential loss by preserving significant sites and by providing data on those that can not be preserved.

VISUAL RESOURCE

All of the action alternatives satisfy the basic TLMP direction for visual resource management described in Chapter 3 (page 3-1) of this document. However, recreation opportunities/potential related to the enjoyment of scenery from some areas mentioned in Chapter 3 would be modified with harvest. Both Mosman and Burnett Inlets would be affected, with the greatest impacts likely to occur in Mosman Inlet (Anita Bay was not recommended for protection of recreation potential in TLMP).

Consequences Common to all Action Alternatives

- Group selection helicopter units would likely meet a VQO of Retention or Partial Retention; units may be noticeable (particularly in winter) but would appear as natural patterns.
- Generally, the impacts of the helicopter-logged clearcuts would be less than those associated with the cable-yarded units. Fewer roads would be necessary and more vegetation would be left standing after harvest.
- In most cases, road segments would be visible only where they pass through clearcuts. Roads along south Anita Bay are likely to be visible from the bay in only a few short stretches, but would likely be noticeable from Zimovia Strait.

Alternative 1

This alternative would visually impact Zimovia Straits, Anita Bay, the head of Burnett Inlet, the head of Mosman Inlet, and the eastern side of Mosman Inlet. Refer to Map 4-1.

In **Anita Bay**, nine units would be visible in the middleground viewing distance (units 101 thru 107, and 114 thru 116). The upper portion of unit 124 would be seen in the background. Within-stand modification would be recommended for three units (101, 114 and 115) in order to meet the inventory VQO of modification.

One unit (101) would be viewed in the middleground from **Zimovia Strait**, and five units would be seen in the background (103 thru 107). Unit 101 has potential to be viewed from Nemo Point southward along Zimovia, but is likely to meet inventory VQOs if carefully designed.

From the head of **Burnett Inlet**, six units would be seen in the middleground viewing distance (113, 114, and 108 thru 111). Three units are recommended for within-stand modification (113, 109 and 110). Unit 114 was previously recommended in discussion of Anita Bay. The combined effects of existing and proposed harvest around the head of this inlet are likely to result in a visual appearance of Maximum Modification, while the inventory recommends Modification. Reducing harvest in Detailer Creek would help to achieve a Modification appearance.

From **Mosman Inlet**, one unit (131) would be seen in the foreground and five units would be seen in the middleground (129, 132, 133, 135 and helicopter unit 142). Two units would be viewed in the background from the head of Mosman (117 and 124). Within-stand modification would be recommended for two units (135 and 142). Unit 135 has potential for high visual impact due to its size, steep slopes and proximity to the inlet. The entire unit is likely to be seen, and may not meet the inventory VQO of Modification. As currently designed, cumulative impacts of past and proposed harvest along Mosman would likely result in a visual appearance of borderline Modification/Maximum Modification. Redesign of unit 135 would be recommended to meet a Modification VQO.

From Stikine Strait, a portion of helicopter unit 139 may be visible for a short time in the background.

Road impacts unique to this alternative: Sections of the road extending from unit 131 in Mosman Inlet to unit 135 would be seen from Mosman. A particularly difficult section between units 131 and 132 would likely result in exposed rock fill along perhaps a third of this distance.

Map 4-1. Alternative 1 Seen Area

62 percent of entry seen

Map 4–2. Alternative 2 Seen Area

64 percent of entry seen

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Proposed Group Selection
- Proposed Clearcut
- Existing Clearcut
- Sensitive Seen Area VMC 1 & 2

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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Alternative 2

This alternative would visually impact Anita Bay, the head of Burnett Inlet, the head of Mosman Inlet, the eastern side of Mosman, and Marble Point. Refer to Map 4-2.

In **Anita Bay**, 11 units would be visible in the middleground viewing distance (units 201 thru 207, 211, 212, 217 and 218). Within-stand modification would be recommended for four of these (203, 211, 212 and 217) to meet the inventory VQO of Modification.

Two units (201 and 202) may be seen in the middleground from **Zimovia Strait**, and four would be seen in the background (204 thru 207). Inventory VQOs would likely be met by these units as currently designed.

From the head of **Burnett Inlet**, three units would be seen in the middleground (208, 209 and 211). Small portions of unit 210 might be visible as well. Within-stand modification would be recommended for two of these units (208 and 209); the third (211) was previously recommended in the Anita Bay discussion. The combined visual effects of past and proposed harvest would likely meet a VQO of Modification, given within-stand modification.

In **Mosman Inlet** and off **Marble Point**, nine of the eleven proposed units would be seen in the middleground viewing distance (units 234 thru 239, 231, 232, and helicopter unit 246). One unit (230) would be seen in the foreground. Unit 219 would be seen in the background from the head of Mosman Inlet; two existing units are visible in the same area. Within stand modification would be recommended for four of these proposed units (238, 235, 234 and 246). The combined effects of past and present harvest would likely result in an appearance of borderline Modification/Maximum Modification. Unit 234 has potential for high visual impact due to its size, steep slopes and proximity to the inlet. Redesign of this unit would be recommended to meet a VQO of Modification.

Road impacts unique to this alternative: Impacts of road construction would be similar to those described for Alternative 1. Roads south of unit 234 would likely only be visible where they cross a harvest unit.

Alternative 3

This alternative would visually impact Anita Bay, Zimovia Strait, the head of Burnett Inlet and the head of Mosman Inlet. Refer to Map 4-3.

In **Anita Bay**, 11 units would be visible in the middleground viewing distance (units 301 thru 307, 311, 312, 318 and 319). The higher elevations of unit 327 would be seen in the background. Within-stand mitigation would be recommended for six of these units (301, 302, 305, 311, 312 and 318) to meet an inventory VQO of Modification.

Portions of unit 301 would be seen in the middleground from **Zimovia Strait**, and three other units would be viewed in the background (305, 306 and 307). Unit 301 has potential to be viewed from Nemo Point southward along Zimovia, but would likely meet inventory VQOs if carefully designed.

In **Burnett Inlet**, portions of four units would be seen in the middleground (308 thru 311). Within-stand modification would be recommended for three of these (309, 310 and 311). Combined impacts of past and proposed harvest would likely meet the inventory VQO of Modification in the middleground.

In **Mosman Inlet**, helicopter unit 338 would be seen in the middleground and unit 331 would be seen in the foreground. Two units would be seen in the background (327 and 320). Within stand modification would be recommended for unit 338 to meet a Modification VQO.

Road impacts unique to this alternative: No additional impacts.

Alternative 4

This alternative would visually impact Anita Bay, Zimovia Strait, the head of Burnett Inlet and the head of Mosman Inlet. Refer to Map 4-4.

In **Anita Bay**, seven units would be seen in the middleground viewing distance (units 401 thru 406 and 411). The size of units 401 through 403 could create a visual condition of Maximum Modification. Five units would be recommended for within stand modification (401, 402, 403, 405 and 406) to meet an inventory VQO of Modification. One setting is recommended for deferral in unit 403. Unit 419 would be seen in the background from both Anita Bay and Mosman Inlet.

Unit 401 would be seen in the middle ground from Zimovia Strait and units 402, 403, 404 would be seen in the background. Unit 401 has potential to be viewed from Nemo Point southward along Zimovia. Within-stand modification as recommended above would likely allow these units to meet inventory VQOs.

In **Burnett Inlet**, unit 405 would be seen in the middleground viewing distance, and has been recommended for modification previously in the Anita Bay discussion. An appearance of Modification would likely result from the combined effects of past and proposed harvest.

In **Mosman Inlet**, two units would be seen in the middleground (425 and helicopter unit 433). Within stand modification would be recommended for unit 433. Three units would be seen in the background (412, 419 and 420). Because of their proximity to two existing large, square-shaped units, within stand modification is recommended for all three proposed units to lessen their cumulative impact. Combined effects of past and proposed harvest would likely produce an appearance of Modification in the background, and borderline Modification/ Maximum Modification for the middleground view of Wetbeck drainage.

Road impacts unique to this alternative: No additional impacts.

Alternative 5

This alternative would retain the analysis area in its present visual condition. Existing harvest units seen from Anita Bay and the heads of Mosman and Burnett Inlets would have more time to visually recover before the next entry. Taller second growth in these units would help the next entry meet inventory VQOs.

Cumulative Impacts with Future Entries

The long, fiord-like inlets of this analysis area provide unique viewing opportunities for a large percentage of the land base. With so much of the landbase visible, screening harvest activities becomes difficult. In the case of this analysis area, nearly 80 percent of the operable CFL is visible from saltwater travel routes.

Past harvest in these three VCUs (Granite and Quiet sales) has removed about 25 percent of the nonseen operable CFL. This proposed entry is likely to remove another 30 percent, leaving less than half of the total to last through the end of this rotation. Approximately seven more timber sales of similar acreage to this entry could occur in this analysis area over the next 80 to 90 years to remove nearly all of the remaining operable CFL. Clearly the nonseen operable CFL is not likely to last through this rotation as a means to minimize the impacts of clearcutting. In fact, if the next two sales average 50 percent visible (as would be true of this entry), the remaining nonseen operable CFL would be removed. The following five sales would be 100 percent visible, meaning all or part of every harvest unit would be seen from saltwater.

If inventory VQOs are to be met on the steep, highly visible slopes of this analysis area in the future, within stand modification and careful unit shaping will likely be the most effective methods to use. Helicopter logging would also reduce visual impacts, requiring less roading, and allowing more creative unit shapes. These techniques tend to increase the logging costs to the operater and cost to the government of sale design, preparation, and administration. These may however, be appropriate tradeoffs in highly visible, steep landscape situations.

Map 4-3. Alternative 3 Seen Area

54 percent of entry seen

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Proposed Group Selection
- Proposed Clearcut
- Existing Clearcut
- Sensitive Seen Area VMC 1 & 2

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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Map 4–4. Alternative 4 Seen Area

46 percent of entry seen

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Proposed Group Selection
- Proposed Clearcut
- Existing Clearcut
- Sensitive Seen Area VMC 1 & 2

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

N

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19 Feb 91

SOILS

The risk of impact on soils from timber harvest is often rated in terms of soil hazard classifications. Soil hazard classes reflect the probability of soil movement resulting from logging or road building activities. The probability is related to a number of factors such as soil strength, soil wetness, and slope. The soils in the low hazard class are found on 0 to 35 percent slopes. They are mostly stable in the natural setting and have little probability of soil movement if disturbed. Moderate hazard soils are generally found on 35 to 75 percent slopes. They are relatively stable in the natural setting but the probability of movement increases if they are disturbed. The soils in the high hazard class are usually found on slopes greater than 75 percent. They often creep or slide in a natural setting and are extremely prone to soil movement if disturbed. Consequences from timber harvest are related to the number of acres harvested and the soil hazard class on which the trees are growing.

Timber Harvest and Soil Hazard Class

Table 4-7 shows the area of land in each hazard class that would be harvested for each alternative. This data is based on the Soil Resource Inventory for Etolin Island. Areas proposed for harvest on high hazard soils in Table 4-7 will be field verified prior to the Final EIS. Field verification will include an analysis of the risks of mass wasting and an evaluation of the potential impacts to other resources. Some changes in design and configuration of units and roads can be expected as a result of this on-site investigation.

Table 4-7. Area Harvested by Soil Hazard Class (Acres)

Soil Hazard Class	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Low	515	697	482	670	0
Moderate	1153	1168	1168	969	0
High	138	127	117	81	0
Total	1805	1992	1684	1720	0

Road Building

Road building impacts are related to the length of road constructed and the soil hazard class in which each segment is built. Table 4-8 shows the miles of road in each hazard class for each alternative. A small amount of soil sliding and slumping is likely. Roads proposed to be built on high hazard soils will be field verified prior to the Final EIS.

Table 4-8. Total Miles of Road Proposed by Soil Hazard Class

Soil Hazard Description	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Low	12.4	18.7	14.8	15.3	0
Moderate	13.5	16.0	11.5	9.6	0
High	0.6	0.2	0.6	0.6	0
Total	26.5	34.9	36.9	25.5	0

Cumulative Effects

The range of time required for potentially unstable areas to restabilize varies greatly. Some unstable areas can stabilize in as little as three to five years while others require more time. While some become chronic sources of sediment, any slides or slumps in the analysis area are expected to recover relatively quickly.

Wetlands and Floodplains

Since a large amount (about 42 percent) of the Etolin analysis area is classified as wetlands, they are not considered a scarce resource. Resource values associated with these wetlands varies greatly depending on the type of wetland, proximity to water bodies, landscape position, etc. Alternatives were designed to minimize potential impacts to identified high value areas rather than to avoid development on all areas classified as wetland.

The potential impact to wetlands is indicated by the amount of forested wetlands proposed for harvest (Table 4-9), and the amount of specified road proposed to be built on areas classified as wetland (Table 4-10).

Timber Harvest and Wetlands

Alternative 4 would harvest the greatest amount of forested wetlands, followed by Alternative 2 and Alternative 3. Alternative 1 would harvest the least.

Table 4-9. Timber Harvest on Forested Wetlands

Harvest on Wetlands	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Acres of Forested Wetlands	181	209	199	225	0
Percent of Forested Wetlands	2.5%	2.9%	2.8%	3.2%	0
Percent of Total Wetlands	0.6%	0.7%	0.7%	0.8%	0

Roads and Wetlands

The wetland vegetation, soil drainage or hydric character of a wetland will not be measurably altered by road construction except for the width of the roadfill itself. This is normally about 24 feet wide and amounts to approximately 2.9 acres per mile.

Alternative 1 would result in somewhat less road construction on wetlands than Alternatives 2, 3, or 4.

Table 4-10. Proposed Road Construction on Wetlands

Roads on Wetlands	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Miles of Road	7.5	9.6	9.5	9.4
Acres Covered	22	28	28	27
Percent of Specified Roads on Wetlands	29%	27%	37%	38%

Floodplains

The Executive Order dealing with floodplains was largely intended to prevent the construction and occupancy of floodplains so that flood events would not destroy property and cause loss of life. Given that a timber sale would not encourage people to build structures or live in floodplains, no effects are anticipated.

Cumulative Effects

To date, 195 acres of forested wetlands have been harvested and 13 miles of road has been built on wetlands. The additive effects of each alternative is presented in Table 4-11.

Table 4-11. Cumulative acres of wetlands impacted

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Acres of Road	59	65	65	64	37
Acres Harvested	376	404	394	420	195
Percent of Wetlands	1.5%	1.7%	1.6%	1.7%	0.8%

WATERSHED

The exact impacts of a timber harvest and related road building on water quantity and quality are largely hidden within complex relations involving many diverse watershed features. However, several indicators allow for reasonable estimation of adverse risk to watershed, stream, and water quality. Some of these factors include:

1. The length of stream channels near harvest units (within about 100 feet) that have banks and/or sideslopes sensitive and susceptible to damage.
2. The number, length and type of roads built, and the number of stream and riparian area road crossings required.
3. The cumulative proportion of area harvested in a watershed, with consideration given to its overall "sensitivity" based on factors including soil erodibility, stream stability, and drainage density.
4. Mitigation measures applied, including Best Management Practices (BMPs), Forest Plan guidelines, and site specific prescriptions.

Length of Affected Stream Channels

Risk of water quality degradation increases with the amount of near-stream harvest, and risk is greater where both sides of a channel are affected. Buffer strips, when implemented to protect sensitive banks and riparian areas, reduce this risk considerably; still, streams are at risk to increased sedimentation in the event of windthrow. Table 4-12 summarizes stream lengths that would be potentially impacted by harvesting units near streams in a given alternative. Data are expressed in terms of the management concerns mentioned in Chapter 3--sideslope stability (V-notches and areas where streambank composition minimizes bank stability concerns) and streambank stability (alluvial channels and similar areas where most (not all) buffer strips may be implemented). Data are also differentiated by whether harvest units would occur on one or both sides of a channel. In terms of overall affected stream length, streams would be subjected to the greatest risk by Alternative 2, where 12.6 miles of stream would be be within about 100 feet of a harvest unit. Following, in decreasing order, are Alternatives 1 (12.2 miles), 4 (9.0 miles), and 3 (8.3 miles).

Table 4-12. Length of Streams in or near Proposed Harvest Units (within about 100 feet)

Management Concern	Length of Streams Near Units (Miles)				
With harvest units on:	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
STREAM BANKS					
One side of stream	1.0	1.7	0.4	1.4	0
Both sides of stream	0.6	0.4	0.4	0.6	0
Subtotals:	1.6	2.1	0.8	2.0	0
Percentage*	3%	4%	2%	4%	0%
SIDE SLOPES (including V-notches)					
One side of stream	4.4	4.9	3.3	2.4	0
Both sides of stream	6.2	5.5	4.2	4.6	0
Subtotals:	10.6	10.4	7.5	7.0	0
Percentage*	5%	5%	4%	4%	0%
OVERALL (stream banks plus side slopes)					
One side of stream	5.4	6.6	3.7	3.8	0
Both sides of stream	6.8	5.9	4.6	5.2	0
Totals:	12.2	12.5	8.3	9.0	0
Percentage*	5%	5%	3%	4%	0%

*Percentages below the subtotals and totals describe their part of the total lengths given in Chapter 3 for the two stream management concerns.

Roads and Stream Crossings

The Transportation section of this chapter includes information regarding the type and length of roads to be constructed. Other factors being equal, the greater the total road length, the higher the risk of water quality degradation. Data from this section indicate that Alternative 2 would require the most new construction of roads (35 miles), followed in decreasing order by Alternative 3 (26 miles), Alternative 1 (26 miles), and Alternative 4 (25 miles). The Fisheries section of this chapter describes riparian area road building and the crossings of mapped streams.

Cumulative Length of Affected Stream Channels

The cumulative effect of harvest units on streams includes the additive effect of stream lengths near proposed (Table 4-12) as well as existing harvest units (Table 4-13). In terms of overall affected stream length, streams would be at greatest risk under the cumulative effects of alternative 2, where 22.1 miles of channel would be near or pass through units (Table 4-13). Following, in decreasing order of overall affected stream length, are Alternative 1 (21.8 miles), Alternative 4 (17.8 miles), and Alternative 3 (17.6 miles). Selection of Alternative 5, the No Action Alternative, would have the cumulative result of 9.6 miles of stream near units.

Table 4-13. Cumulative Length of Streams in or near Proposed and Existing Harvest Units (within about 100 feet)

Management Concern	Length of Streams Near Units (Miles)				
With harvest units on:	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
STREAM BANKS					
One side of stream	3.5	4.1	2.8	3.9	2.5
Both sides of stream	2.2	2.1	2.1	2.3	1.7
Subtotals:	5.7	6.2	4.9	6.2	4.2
Percentage*	11%	12%	10%	12%	8%
SIDE SLOPES (including V-notches)					
One side of stream	5.9	6.4	4.8	3.9	1.5
Both sides of stream	10.2	9.5	8.2	8.5	4.0
Subtotals:	16.1	15.9	13.0	12.4	5.5
Percentage*	8%	8%	7%	6%	3%
OVERALL (stream banks plus side slopes)					
One side of stream	9.4	10.5	7.6	7.7	3.9
Both sides of stream	12.4	11.6	10.3	10.9	5.7
Totals:	21.8	22.1	17.9	18.6	9.6
Percentage*	9%	9%	7%	8%	4%

*Percentages below the subtotals and totals describe their part of the total lengths given in Chapter 3 for the two stream management concerns.

Cumulative Effects of Roads and Stream Crossings

Cumulative lengths of roads within watersheds include proposed new construction as well as previously constructed roads. The greatest cumulative length of roads would occur in Alternative 2 (58 miles), followed in decreasing order by Alternative 3 (49 miles), Alternative 1 (49 miles), and Alternative 4 (48 miles) (refer to Table 4-17, page 4-36 in the Transportation section). The No Action Alternative would maintain the existing total road length of 23 miles.

Cumulative Proportion of Area Harvested by Watershed Sensitivity

McCorison, et. al. (1988) developed a model to determine relative sensitivities of watersheds in southeast Alaska. These sensitivities were used in conjunction with beneficial use indices to estimate watershed harvest thresholds of concern. Harvest near or over the threshold indicates increased risk of water quality degradation. Factors considered in this model include drainage densities, average channel stabilities of various channel types, erodibility of the various soils encountered, and an index of beneficial use values.

This model first assigns to each watershed one of four corresponding sensitivity classes. Maps 4-5 through 4-8 (opposite) illustrate the sensitivities of the individual watersheds and the proposed unit locations for each alternative. Then the model considers the beneficial uses of the various streams and the sensitivity of their respective watersheds before assigning each watershed a recommended maximum harvest area. This percentage of the total watershed area is referred to as a watershed's threshold of concern (TOC).

When the model was applied to the analysis area, the results indicated most watersheds would contain cumulative harvest levels well below their threshold of concern. Typical of most watersheds in the analysis area are watersheds Q17A and Q20A. Thresholds of concern for these watersheds were estimated to be 50 and 20 percent of the watershed area for Q17A and Q20A, respectively (Figure 4-2).

Alternative 5 (the No Action Alternative), though proposing no new harvest units, still results in a cumulative 4 percent total harvest area in Q17A because of prior harvest; Q20A would remain unharvested. The four action alternatives in Q17A represent the sum of past (4 percent) and proposed harvests; thus, the figures represent the cumulative result of harvest unit area on the watershed.

For example, Alternative 1 proposes harvesting the greatest area at about 8 percent of the total watershed. With the 4 percent previously harvested, the cumulative affected harvest area is 12 percent of the watershed. This compares to the estimated threshold of concern of 50 percent.

Q20A sustains harvest only in Alternatives 1 and 2. In this case, cumulative affected area is equal to only the proposed harvest area. Alternative 1 would harvest 3 percent of the watershed area; Alternative 2 would harvest 6 percent. Both of these values are well below the estimated harvest threshold of 20 percent.

Only two watersheds were determined to contain harvest unit area in excess of their estimated thresholds of concern. Q19B, a third order sub-watershed north of Mosman Inlet, already exceeds its estimated threshold of 20 percent, currently at 27 percent (Figure 4-2). However, no harvest was scheduled in this sub-watershed in any alternative.

Q19C, also a third order sub-watershed northwest of Mosman Inlet, is the only watershed where harvest in an action alternative would exceed the threshold of concern, estimated at 10 percent. Due to harvest of units in prior timber sales, harvested area already exceeds the threshold at 14 percent (Figure 4-2). Alternative 4 is the only alternative to harvest additional acreage within this watershed--less than 4 acres. At 369 acres, Q19C units will have 15 percent of its area in harvest--5 percent over its estimated threshold.

Because these two are sub-watersheds of one large watershed, impacts will be mitigated to some extent due to the moderating effect of large watersheds. It should be noted that initial planning schemes scheduled harvests in Q19C in several alternatives, including a harvested area of 21 percent in Alternative 4. The interdisciplinary team process helped to mitigate this concern, minimizing harvest and reducing risk.

Map 4-5. Alternative 1 Units in Watersheds

LEGEND

- Major Streams
- Study Area Boundary
- Shoreline
- Proposed Group Selection
- Proposed Clearcut
- Existing Clearcut
- Non-Dissected Slopes
- Low Sensitivity
- Moderate Sensitivity
- High Sensitivity
- Extreme Sensitivity

MAPSCALE 1:100000

1 0 1 2 3 4 Miles

SCALE is 1 INCH = 1.58 MILES

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Map 4-6. Alternative 2 Units in Watersheds

Map 4-7. Alternative 3 Units in Watersheds

Map 4-8. Alternative 4 Units in Watersheds

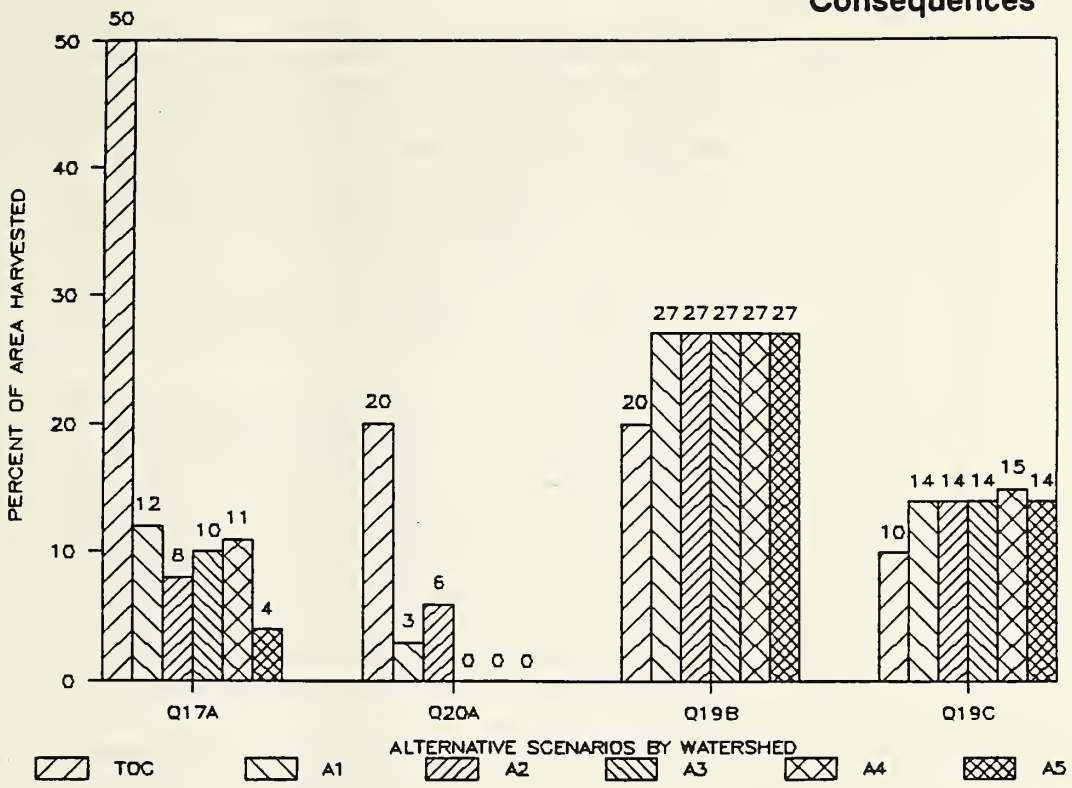

Figure 4-2. Cumulative Watershed Harvest Effects

Mitigation Measures

Aquatic Habitat Management Unit (AHMU; see Chapter 3, Fisheries) guidlelines will be followed and Regional Best Management Practices (BMPs) implemented. These measures will minimize the short term effects on runoff processes and sediment transport. Such measures include site specific use of vegetated streamside buffer strips, full or partial suspension of logs when yarding across streams, "splitlined" harvest settings (streambanks used as boundaries), and minimizing woody debris "loading" in stream channels. No noticeable long-term effects should occur as Southeast Alaska watersheds tend to recover quickly due to the resilience of the forest vegetation.

Timber Economics

The purpose of a financial analysis is to provide a means of comparing the short-term costs and revenues for each alternative. In this analysis, the net value of each alternative was derived by subtracting all production costs, including an allowance for profit and risk, from end-product selling values.

Timber markets vary during the timespan between planning and actually selling a timber sale. It is not uncommon for timber values to change by as much as $200 per thousand board feet during this period. Due to these market variations, the estimate of timber end-product selling value was based on a median or middle level of the timber market.

Manufacturing costs were then subtracted to determine "pond log value," or what the log is worth before processing. In addition, to test whether the sale would constitute an economic offering, an allowance for 60 percent of normal profit at the middle market level was included in determining the timber value. Woods production costs were then subtracted from this value in Table 4-14 to arrive at the total net value of each alternative. Table 4-14 also shows costs and values in dollars per thousand board feet to highlight differences between alternatives.

Costs exceed value in all four action alternatives using mid-market timber values. However, each alternative is close enough to breaking even that a portion of the normal profit and risk allowance is still provided. In addition, if appraised under current conditions, only Alternative 2 would produce a slightly deficit sale. Table 4-14 shows economic factors that were considered for both logging systems included in each alternative: cable logging (mainly high-lead), and helicopter logging. Table 4-15 shows cable systems and helicopter logging combined.

The volume class mix did not vary enough between alternatives to produce a significant difference in timber value per thousand board feet (MBF). For the the same reason, the stump-to-truck logging costs of the cable portion of each alternative are nearly the same.

For timber economics, the greatest real difference between alternatives is in the cost of road per thousand board feet harvested. This difference is mainly due to the varying volume of timber harvested per mile of road built in each alernative.

Alternative 4 has a higher spur road cost because more of the volume is located along existing roads, where only short spurs are needed, rather than new specified road. The transportation cost of the helicopter group selection units is estimated to be the same as the rest of the sale. Even though no truck hauling will be needed, it is felt that this would be offset by the added costs of handling the logs after they are dropped directly into bag booms in Anita Bay by helicopter. The final appraisal will construct a more detailed cost estimate of this part of the operation.

Table 4-14. Timber Values and Costs to an Operator of Average Efficiency (Helicopter and Cable listed separately).

ECONOMIC FACTOR	Cable Alt. 1	Cable Alt. 2	Cable Alt. 3	Cable Alt. 4	Heli-copter CC	Heli-copter Grp. Sel.
VALUE ($/MBF) (pond log minus 60% normal profit)	248	246	247	247	248	246
COSTS ($/MBF)						
Stump-to-Truck	126	126	126	126	179	238
Specified Road	98	116	109	88	NA	NA
Spur Road	7	9	8	14	NA	NA
Transportation	36	38	35	35	35	35
Total Costs	267	289	278	263	214	273
NET VALUE ($/MBF)	-19	-43	-31	-16	34	-27

The net value at mid-market is shown at the bottom of Table 4-15. The preferred alternative, 4, which requires the least amount of new road construction, is the most cost effective. It appraises approximately -$10/mbf at mid-market while allowing 60 percent normal profit and risk. At the breakeven point, it still provides approximately 50 percent of the normal profit and risk allowance to the purchaser. The return to the government will always be at least a minimum base rate set in Forest Service Manual direction. If appraised at current market conditions, due to better than average timber values, the return to the Government would be around $800,000.

Finally, it must be remembered that these values and costs will differ from the final appraised rates. They are used here to provide an economic basis for comparing between alternatives and other timber sales.

Table 4-15. Combined Cable and Helicopter Timber Values and Costs to an Operator of Average Efficiency

Total Cable & Heli	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
VOLUME HARVESTED (MBF)					
Cable	39,000	44,000	36,000	37,000	0
Helicopter CC	6,000	6,000	6,000	6,000	0
Heli. Grp. Sel.	2,000	2,000	2,000	2,000	0
Total	47,000	52,000	44,000	45,000	0
VALUE (Thousand $) (Net all production costs)					
Cable	-741	-1,892	-1,116	-592	0
Helicopter	204	204	204	204	0
Heli. Grp. Sel.	-54	-54	-54	-54	0
Total	-591	-1,742	-966	-442	0
DOLLARS per MBF	-13	-34	-22	-10	0
APPROX. % OF NORMAL PROFIT & RISK	45%	20%	35%	50%	0

Employment

The number and value of jobs provided by the harvesting and processing of timber on the Etolin analysis area is based on the following assumptions:

1. Seven jobs are generated per million board feet of timber harvest.
2. The value of each job is $33,300 per year.
3. The secondary benefit of dollar return to communities is a seven-to-one ratio of the direct job value.

Alternative 2 would generate the most jobs, followed by Alternatives 1 and 4 (see Table 4-16). Alternative 3 would generate the fewest jobs.

Table 4-16. Number and Value of Jobs Generated by a Etolin analysis Area Timber Sale

Factor	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Number Jobs Generated	329	364	308	315	0
Dollar Value (million $)	11.0	12.1	10.3	10.5	0
Secondary Dollar Value (million $)	77.0	84.7	72.1	73.5	0

Cumulative Effects

Selection of one of the action alternatives would contribute to the continued viability of the timber industry in southeast Alaska and the continued socio-economic stability of southeast Alaska communities. Selection of the No Action alternative would not contribute to job or community stability.

Transportation

Forest roads in the Etolin analysis area are classified as either specified or spur roads. The differences are related to the length of service life and the need for control of the road construction process.

Specified Roads

All proposed specified roads would be developed and operated for long term land management. As a part of the forest development road system, specified roads serve as the primary transportation link in the sale area. They provide access to each of the harvest units and link the units to the log transfer facility. Following the timber sale described in this Draft EIS, specified roads would also be used in future timber harvest entries, for recreation access, and for ongoing silviculture activities such as stocking surveys and precommercial thinning. Their location and design is specified by the Forest Service.

Spur Roads

Spur roads are road segments that run from the specified road into the harvest units and the sort yard. Following the initial entry, water bars will be installed on spur roads and spur roads will be allowed to grow back, most likely to alder. Feasible spur locations are suggested by the Forest Service but the contractor may choose alternative routes subject to Forest Service approval. Approval is dependent on a location consistent with the same or less impact than the selected alternative.

Cumulative Effects

The impacts of road construction on the Etolin analysis area are related to the following factors:

The length and location of roads

Specified roads, while providing access, remove some land from timber production and wildlife habitat. In addition, some erosion can be expected as a result of the construction, operation, and maintenance of the roads. (See Fisheries section for discussion of consequences.)

All soil exposed during construction will be grass seeded, and within a few years will not contribute significantly as a sediment source. Spur roads will be closed by removing culverts, installing water bars and allowing alder to grow over the roadbeds. Since the cut banks of these roads are seeded and the roadbeds themselves allowed to revegetate, spurs should not provide a source of sediment until they are used again to harvest the second-growth in around 100 years. (See Table 4-17, page 4-36, for mileage differences between alternatives.)

The most noticeable impact from road construction is the physical alteration of the landscape. The extent of this depends on the terrain on which a road is built. For example, gentle ground often requires no excavation, only rock overlay; very steep ground requires full bench excavation and end haul of excess material. A system of categorizing terrain into terrain types was developed. The following six terrain types have been defined:

I) Generally flat with some sections up to 20 percent sideslope. Ground profile gently rolling, allowing road grade to follow profile with a minimum depth overlay. Occasional short shallow through cuts and through fills. Occasional moderate V-notch drainages up to 15 feet deep. Soil complex is about 30 percent muskeg.

Ia) Same as terrain type I except for an increase in amount of muskeg.
Ib) Same as terrain type I except for a decrease in amount of muskeg.
II) Moderately steep slopes between 20-40 percent. Numerous moderate V-notches up to 20 feet deep. Grade and alignment are adjusted to fit terrain features.
III) Moderate to steep sideslopes 40 to 55 percent. Broken profile with numerous moderate to deep V-notches. Through cuts and through fills are often required to avoid excessive grade rolling.
IV) Steep sideslopes 55+ percent. Full bench construction and end haul of excess excavation generally required.

To help describe some of the physical effects of road building on this project, the number of miles constructed of each terrain type by alternative is listed in Table 4-17.

The number of stream crossings and the amount of road constructed near streams
The construction of culverts and bridges may cause some erosion of sediment into the creeks when and where construction takes place. This will be a short term impact.

Number and location of rock pits required for construction materials
Rock pits, like roads, remove lands from timber production and are a long term impact.

Location of log transfer facility (LTF)
The existing facility at Starfish Cove will be used for this timber sale. Log bundles will also be rafted and stored in Starfish Cove.

Whether not the road system connects with any other road system
For the life of this sale, the roads in this analysis area will not be connected to any other road system; private passenger vehicle use on these roads is not anticipated. However, a portion of the remaining length of Road 6272 connecting to the Olive Cove road system would be constructed in each of the action alternatives, increasing the likelihood of an eventual connection. If and when road 6272 along Anita Bay is connected to the Olive Cove portion of Road 6272, more recreation use of the road system in this analysis area can be expected, especially from the residents around Olive Cove. Conversely, the perception of isolation currently sought by many residents around Olive Cove would be diminished. Table 4-17 lists the miles of Road 6272 remaining to be built to connect the two systems after this sale.

Every effort has been made to locate roads to avoid slope stability problems, provide stable low-impact stream and drainage crossings, and minimize construction and haul costs. In addition, it is recognized that altering the landscape, depending on the nature of bedrock, may create contrasting soil color. This may be noticeable on roads constructed on the mid-slope of steep ground. The road with the most likelihood of being seen on this sale is Road 6272 along Anita Bay. The bedrock along most of this location is granitic, which will initially be very white when exposed. Every effort has been made to locate this road on natural benches and along the tops or bottoms of cutting units which will minimize the visual impact from the bay. When this was not possible we have tried to leave trees below the road to provide a visual screen.

Table 4-17. Some Consequences of the Transportation System.

	Unit	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Specified Road Construction	Miles	24	32	24	21	0
Spur Road Construction	Miles	2	3	2	4	0
Estimated Number of Rock Pits[1]	Units	15	20	16	14	0
Estimated Quantity of Road Rock[2]	Thousand Cubic Yards	305	420	329	308	0
Terrain Type I	Miles	3.3	5.2	4.2	4.7	0
Terrain Type Ia	Miles	0	0	0	0	0
Terrain Type Ib	Miles	0.4	1.0	1.0	0.8	0
Terrain Type II	Miles	16.5	23.6	17.1	16.4	0
Terrain Type III	Miles	4.4	4.0	3.6	2.9	0
Terrain Type IV	Miles	1.0	1.4	0.5	0.4	0
Distance From Connecting Road System to Olive Cove	Miles	2.0	0.2	0.9	0.9	5.8
Estimated Land Converted From Natural State by Road and Rockpit Construction[3]						
Roads	Acres	146	201	155	137	0
Rock Pits	Acres	8	10	8	7	0
Total	Acres	154	211	163	144	0

[1] Based on 1 rock pit every 1.75 miles of total road system.
[2] Based on total road system using estimates which vary by terrain type.
[3] Based on an average of 6.2 acres per mile for specified roads and an average rock pit size of .5 acre.

Energy Requirements

The amount of energy needed to implement the harvest of timber on each alternative is based on the following asssumptions:

1. The rate for timber sale preparation and administration is 0.5 gallon per thousand board feet.
2. The rate for high-lead logging is 2 gallons per thousand board feet.
3. The rate for loading and hauling by truck and for water transport is 8 gallons per thousand board feet.
4. The rate for road construction is 4,000 gallons per mile.
5. The rate for road maintenance is 20 gallons per mile.
6. For the helicopter units, a Bell 214B helicopter would use 160 gallons per hour and would yard 20,000 board feet per hour (8 gallons per thousand board feet).

Table 4-18 shows the energy used for each action alternative:

Table 4-18. Estimated Fuel Consumption by Alternative on the Starfish Timber Sale

Fuel Consumption	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Thousands of gallons	0	645	736	619	621
Average gallons/mbf	0	13.7	14.2	14.1	13.8

List of Preparers

List of Preparers

Members of the interdisciplinary team (IDT) responsible for conducting the Etolin Implementation Analysis and preparing the Environmental Impact Statement are listed alphabetically below:

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Agencies, Organizations, and Persons to Whom Copies of the Statement were Sent

List of Agencies, Organizations and Persons to Whom Copies of This Statement Were Sent

The following organizations and individuals are on the mailing list to recieve the Draft EIS. Number of copies sent are in parenthesis.

Agencies
Alaska Department of Fish and Game, Petersburg (1)
Alaska Division of Governmental Coordination, Juneau (5)
U.S. Environmental Protection Agency, Seattle (5)
Federal Agency Liaison Division, Washington, D.C. (5)
U.S. Dept. of Commerce, NOAA, Ecology & Conservation Div., Washington D.C. (1)
U.S. Dept. of Commerce, NOAA, Nat. Marine Fisheries Service, Juneau (1)
U.S. Department of Interior, Washington D.C. (18)
U.S. Fish and Wildlife Service, Juneau (1)
U.S. Army Corps of Engineers, Anchorage (1)
U.S. Forest Service, Ketchikan Area (1)
U.S. Forest Service, Washington D.C. (5)
U.S. Forest Service, Petersburg R.D. (5)
U.S. Forest Service, Wrangell R.D. (20)
U.S. Forest Service, Chatham Area (1)

Organizations
Alascom, Inc., Anchorage (1)
Thoms Place Homeowners Association (1)
Wrangell Chamber of Commerce (1)
Olive Cove Homeowners Association (1)
Southeast Alaska Conservation Council (1)
Alaska Pulp Corporation, Sitka (1)
Ketchikan Pulp Company, Ketchikan (1)
Wrangell Fish and Game Advisory Committee (1)
Sealaska Corporation, Juneau (1)
Southeast Alaska Conservation Council (1)
Southern SE Regional Aquaculture, Ketchikan (1)
Aquaculture Incorporated, Wrangell (1)
American Wilderness Alliance (1)
Heritage North, Seatlle (1)
Ketchikan Sports and Wildlife Club (1)
Meyers Chuck Community Association (1)
Mitkof Lumber Co., Inc., Petersburg (1)
Narrows Conservation Coalition (1)
National Audubon Society, Juneau (1)
Petersburg Vessel Owners (1)
Puget Sound Log Scaling & Grading Bureau, Thorne Bay (1)

Rocky Mountain Elk Foundation, Ketchikan (1)
S.A.V.E. Inc. (1)
Sierra Club, Juneau (1)
Sierra Club, Sitka (1)
Sierra Club Legal Defense Fund, Inc. (1)
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Tongass Conservation Society, Ketchikan (1)
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Glossary

Glossary

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980, this legislation designated 14 national wilderness areas in southeast Alaska.

Anadromous
Refers to those fish, usually salmonids, that spawn (some also rear) in freshwater and mature in saltwater.

Aquatic Habitat Management Unit (AHMU)
An area of stream and associated streamside habitat having fish values of such importance that land use activities will be prescribed to meet the management goals for fish habitat.

Buffer Zone
An area surrounding a special feature in order to protect it from development.
eagle nest trees: 330 foot radius around eagle nest trees
cultural sites: as needed

Carrying Capacity
The number of animals that an area can maintain in a healthy condition.

Commercial Forest Land (CFL)
Commercial forest land is land that can produce at least 8,000 board-feet of timber per acre in one hundred years.

Cultural Resource
Any evidence of mankind's activities and behavior; includes data from archeology, architecture, ethnology, and history.

Dispersed Recreation
Outdoor recreation use occurring outside a developed recreation site; includes such activities as scenic driving, hunting, backpacking, and boating.

Distance Zones
Landscape areas denoted by specific distances from the observer, and characterized by the level of detail apparent in the subject.

Foreground: The detailed landscape within 0 to 1/4-1/2 mile of the viewer. Individual leaves and branches provide coarse texture.

Middleground: The area located within 1/2 to 3-5 miles of the viewer. Individual trees and tree groupings provide texture and form.

Background: The area within 3-5 miles to infinity of the viewer. Texture becomes indescernible; shapes and washes of color become more dominant than texture.

Estuary
For purpose of this EIS process, estuary refers to the relatively flat, intertidal, and immediate upland areas, generally found at the heads of bays and mouths of streams. They are predominantly mud and grass flats and unforested except for scattered spruce or cottonwood.

Floodplain
The lowland and relatively flat areas joining inland and coastal waters, including debris cones and flood-prone areas of offshore islands, including, at a minimum, that area subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given area.

Inoperable Timber
Timber which is not practical to harvest because of potential resource damages, economic infeasibility, physical limitations or inaccessiblility.

Interdisciplinary Team (IDT)
A group of individuals representing different areas of knowledge and skills focusing on the same task, problem, or subject.

Irretrievable Commitment
The production or use of renewable resources that is lost because of allocation decisions. It represents opportunities foregone for the period of time that the resource cannot be used.

Irreversible Commitment
Commitment of resources that are renewable only over a long period of time, such as soil productivity, or to nonrenewable resources, such as cultural resources or minerals.

Land Use Designation (LUD)
The method of classifying land use by the Tongass Land Management Plan. Land uses and activities are grouped together with a set of coordinating policies, an essentially compatible combination of management activities. A brief description of the four classifications follows:

LUD I: Wilderness areas.

LUD II: These lands are to be managed in a roadless state to retain their wildland character, but this designation would permit wildlife and fish habitat improvement, utility corridors, and primitive recreation facility development and roads under special authorization.

LUD III: These lands are to be managed for a variety of uses. The emphasis is on managing for uses and activities in a compatible and complimentary manner to provide the greatest combination of benefits.

LUD IV: These lands will provide opportunities for intensive resource use and development. Emphasis is primarily on commodity or market resources.

Log Transfer Facility (LTF)
A facility located where the road network terminates at saltwater. May be used for a number of transportation purposes. For timber harvesting, the log transfer facility is where logs are bundled and placed into rafts on the water for towing to local mills.

Mass Failures or Mass Movement
The downslope movement of a block or mass of soil. This usually occurs under conditions of high soil moisture, and does not include individual soil particles displaced as surface erosion.

MBF and MMBF
Thousand board feet and million board feet, respectively.

Mid-Market
Mid-market timber is timber which a mid-market assessment described herein indicates would provide a weighted average margin for profit and risk of at least 60% of normal. The mid-market assessment to mid-market timber shall be based on mid-market weighted average pond log value, estimated logging and road costs, normal profit ratios, and base rates developed using standard Forest Service appraisal methods and data ineffect on the date the Forest Service initiates the NEPA process (Notice of Intent is published in the Federal Register).

Pond Log Value- Mid-market average pond log value shall be determined as follows: 1) Appraisal data to develop a mid-market pond log value shall be determined for each species, and shall be the standard Forest Service appraisal data in effect in the quarter in which the pond log value (end-product selling price less manufacturing cost) for the species and product mix most closely matches the point between the ranked quarters of the Alaska Index Operations pond log value, adjusted to Common Year Dollars, where one-half of the timber from the Tongass National Forest has been removed at higher values and one-half of the timber from the Tongass National Forest has been removed at lower values during the period from the first quarter of 1979 to the quarter current on the NEPA start date. When more than one quarter would qualify, the most recent shall be used. 2) Mid-market weighted average pond log value shall be calculated by volume class, adjusted to Common Year Dollars, using appraisal data determined for each species.

Common Year Dollars- are dollars adjusted to the NEPA start date, using the relevant indicies in the Producer Price Index for all commodities published by the USDL Bureau of Labor Statisics.

Mining
Includes all operations (prospecting, exploration, development) for the extraction of mineral resources--underground, placer, and open pit mines; rock, and sand and gravel borrow, etc.

Mitigation
Action or actions taken to avoid or minimize negative impacts of a management activity. Includes avoiding an impact altogether by not taking a certain action or part of an action; minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

Monitoring
Following a course of events to determine what changes occur as the result of an action.

NEPA
National Environmental Policy Act of 1969.

New Perspective
New Perspective is the pathway for implementing certain of the new directions in the 1990 RPA Program (the Forest Service's 5-year strategic program for carrying out its mission under federal laws and regulations) and new Forest and Research plans. These plans and programs call for their full array of values and benefits, with increased emphasis on fisheries, wildlife, recreation, ecological sustainability, and long-term

productivity. The two main goals of New Perspectives are; 1) to demonstrate the new directions for socially responsive and scientifically sound management of lands and resources to meet people's needs for forest and rangeland products while protecting natural and cultural resources for long-term health of the land and quality of life, 2) to develop the new scientific knowledge and technologies needed to better manage forest and rangeland ecosystems.

NFMA
National Forest Management Act of 1976.

Non-Commercial Forest Lands
Lands with more than 10 percent cover of commercial tree species but not qualifying as Commercial Forest Land.

Primary Protection
Primary Protection of Primary Streamcourses is a timber sale contract provision requiring the protection of designated "Primary" streams. This involves developing an Operating Plan (including timing and guyline circle trees) for falling timber within a 200-foot streamside strip, directional felling away from streamcourses, immediate yarding of any trees entering streamcourses, leaving designated felled or windthrown trees that have entered streamcourses, and full suspension yarding across such streamcourses. "Primary" streamcourses are usually fish streams or other streams requiring a high degree of water quality protection.

Profit & Risk
That portion of the appraisal allocated to industry profit, interest on borrowed capital, risk, and income taxes.

Profit & Risk Margin
The monetary estimate of Profit & Risk

Recreation Opportunity
The availability of real choice for recreationists to participate in a preferred activity within a preferred setting, in order to realize those satisfying recreation experiences which are desired. Recreation opportunities are often described in terms of six classes of opportunity:

Primitive: The most remote, undeveloped, and inaccessible opportunities. Generally includes areas out of sight and sound of human activities and greater than three miles from roads or waterways open to public travel.

Semi-Primitive, Non-Motorized: Limited opportunities for isolation from the sights and sounds of humans, and a high degree of teneration with the natural environment. Generally includes those areas greater than 1/2 mile and less than three miles from waterways, with roads and trails open to motorized use.

Semi-Primitive, Motorized: Predominantly unmodified natural environment with minimum evidence of sights and sounds of humans with primitive roads and trails open to motorized use. Generally includes areas less than 1/2 mile from waterways. Roads are not maintained.

Roaded, Natural: Predominantly natural environments with moderate evidence of sights and sounds of humans. Includes areas less than 1/2 mile from roads open to public travel, railroads, waterways, major powerlines and within resource modification areas.

Rural: Includes those areas within small communities, developed campgrounds, developed ski areas, and administrative sites. Modifications are primarily to enhance specific recreation activities. Sights and sounds of humans are readily evident.

Modern-Urban: Substantially urbanized environments, although the background may have elements of a natural environment. Renewable resource modifications and utilization practices are common. Vegetative cover is often exotic and manicured. Sights and sounds of humans are predominant.

Resident Fish
Fish which are not anadromous and which reside in fresh water on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat and rainbow trout.

Riparian Ecosystems
Includes wetlands, streams and lakes, and those areas around streams and lakes which can influence the aquatic environment.

Rotation
The planned number of years between the formation of regeneration of a stand and its final cutting at a specified stage of maturity.

Secondary Protection
Secondary Protection or Protection of Secondary Streamcourses is a timber sale contract provision requiring the protection of designated "Secondary" streams. This involves removing timber felled across such streams within same operating season, and removing logging slash from the streamcourse before the yarder leaves the harvest unit or upon completion of seasonal logging activities, whichever comes first. "Secondary" streamcourses are those which do not possess fish habitat but could affect habitat downstream.

Sedimentation
Addition of fine organic or inorganic material to a stream channel. Usually that portion remaining in the streambed gravel.

Sensitivity Levels
A measure of viewer interest in scenic quality of the landscape as seen from roads, trails, waterways or other travel routes and from facilities or other areas of the national forest that have significant public use. Level 1 has the highest sensitivity, level 3, the lowest.

Setting
The setting identifies the timber stands that are tributary to a landing by use of a given timber harvest system.

SHPO
State Historic Preservation Officer

Soil Hazard Classes
Mass-wasting as used here is restricted to relatively shallow translational failures of the soil mass, and specifically excludes deep rotational failures and debries failures within stream channels. While slope gradient is the primary site factor determining the stability of natural slopes, soil and geologic properties, such as cohesion, moisture regime and the presence of a prominent slip-plane are used to determine relative

stability of soil/landtype units. The relative ranking is based on state-of-the-art research, laboratory data on soil properties, as well as our collective experience in the management of similar soil/landtype areas on the Tongass N.F.

High: The soil/landtype units in this class are the least stable, and have the greatest probability of slope failure. These units generally have slope gradients that exceed the natural angle of stabilty. It includes most well drained soils on slopes of 75 percent or greater, as well as some soils with restricted drainage (somewhat poorly and poorly drained soils)on slopes in excess of 65 percent. Most natural occuring landslides initate in units of this class. They often, but not always, have visible indications of instabilty or past failures, such as slide scarps, tension cracks, jack-strawed trees, mixed pedogenic horizons etc.

The risk of management induced slope failures is so high on these areas that they are generally precluded from normal forest harvest and roading activities. Where management activies can not be avoided on these areas, site specific investigations are necessary to determine on a case-by-case bases; (1)the probability of failure based on a site-specific stability analysis; and (2) the likely effect of a failure on associated resources such as water quality, fish habitat, etc. Forest roads can sometimes be built on these areas by locating them on included areas of less sloping benches, or by the application of unusual, and often prohibitively expensive, mitigative measures such as retaining walls, buttresses, bulkheads or other external support systems.

Moderate: The soil/landtype units in this class are generally stable in an undisturbed condition, however, any natural disturbance or management practice that adversely changes the complex soil strength-stress relationship can result in slope failures. These areas rarely have visible indications of instability.

Soil/landtypes in this class can be safely managed without a high risk of landslides by application of management practices designed to maintain the shear strength of soil and roots, and avoid increasing the effective weight of the soil mass. Management practices should be designed to avoid interrupting the natural surface and subsurface drainage patterns and minimize disturbance to the soil surface.

Low: Soil/landtype units in this class have the least probability of landslides. Any slope failures that do occur are usually associated with included incised stream channels (V-notches), or short steep escarpments. This class includes most soils with slope gradients less than 35 percent.

These areas are normally not subject to mass wasting, however management practices designed to protect streambanks and v-notches, and prevent surface erosion are appropriate.

Temperature-Sensitive Stream
Those streams flowing out of lakes or muskegs, or for some other reason susceptible to warming beyond a tolerable level for fish.

Unit
A term from the Timber Sale Contract. This term is used to describe the smallest identifiable portion of land included in a timber sale for timber harvest. Each Unit consists of one or more settings and associated landings. All the settings included in a Unit are planned for timber harvest using the same yarding method and are in proximity to each other.

VCU - Value Comparison Unit
A distinct geographic area that generally encompasses a drainage basin containing one or more large stream systems. Boundaries usually follow easily recognizable watershed divides. These units were established to provide a common set of areas for which resource inventories could be conducted and resource values interpretations made.

Visual Absorption Capability (VAC)
A measure of the relative ability of the landscape (high, intermediate or low) to absorb visual change. Ratings are based on landform complexity, slope, viewer aspect/angle and vegetative screening. High VAC is characterized by low rolling topography or unseen slopes where management activities are not likely to be seen. Low VAC is characterized by steep, highly visible hillsides with a uniform cover of vegetation.

Visual Management Classes (VMC's)
A product of the combination of VQO's and VAC's, Visual Management Classes indicate the management objective and the relative effort required to meet that objective. VMCs 1 and 2 indicate areas of high scenic value or landscapes with steep, highly visible slopes. Special attention to project design would be necessary to meet VQOs. VMCs 3 and 4 indicate areas that are generally not seen or that have low, rolling topography, and VQOs would be relatively easy to meet.

Visual Quality Objectives (VQO's)
VQOs are standards for visual quality which reflect the varying degrees to which the landscape may be modified. The standards are based upon viewing distance, the character of the natural landscape, and the public's concern for scenic quality. "Inventory" VQO's have not yet undergone trade-off analysis relative to other resources. "Adopted" VQO's reflect analysis involving other resources and become management direction in a selected and approved land management alternative. The five visual quality management objectives are:

Preservation - Allows only ecological changes. Management activities, except for very low visual impact recreation facilities, are prohibited.

Retention - Provides for management activities which are not visually evident. Management activities are permitted but the results of those activities on the natural landscape must not be evident to the average viewer.

Partial Retention - Management activities may be evident to the viewer, but must remain visually subordinate to the surrounding landscapes.

Modification - Management activities may visually dominate the original surrounding landscape but must borrow from naturally established form, line, color, and texture.

Maximum Modification - Land management activities can dominate the natural landscape to a greater extent than in the modification objective except as viewed from background when visual characteristics must be those of natural occurrences within the surrounding area.

Wetlands
Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Winter Range
Areas used by animals from December through March, when many sources of food are covered with snow. For deer, winter range is generally found below 1200 feet elevation on north-facing slopes and below 1500 feet elevation on all other slopes. During severe winters, the greatest number of deer can be supported by high-volume, old-growth stands on south-facing slopes, below 500 feet elevation and within 1/4 mile of salt water.

Index

Index

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Appendix A

Management Indicator Species Graphs

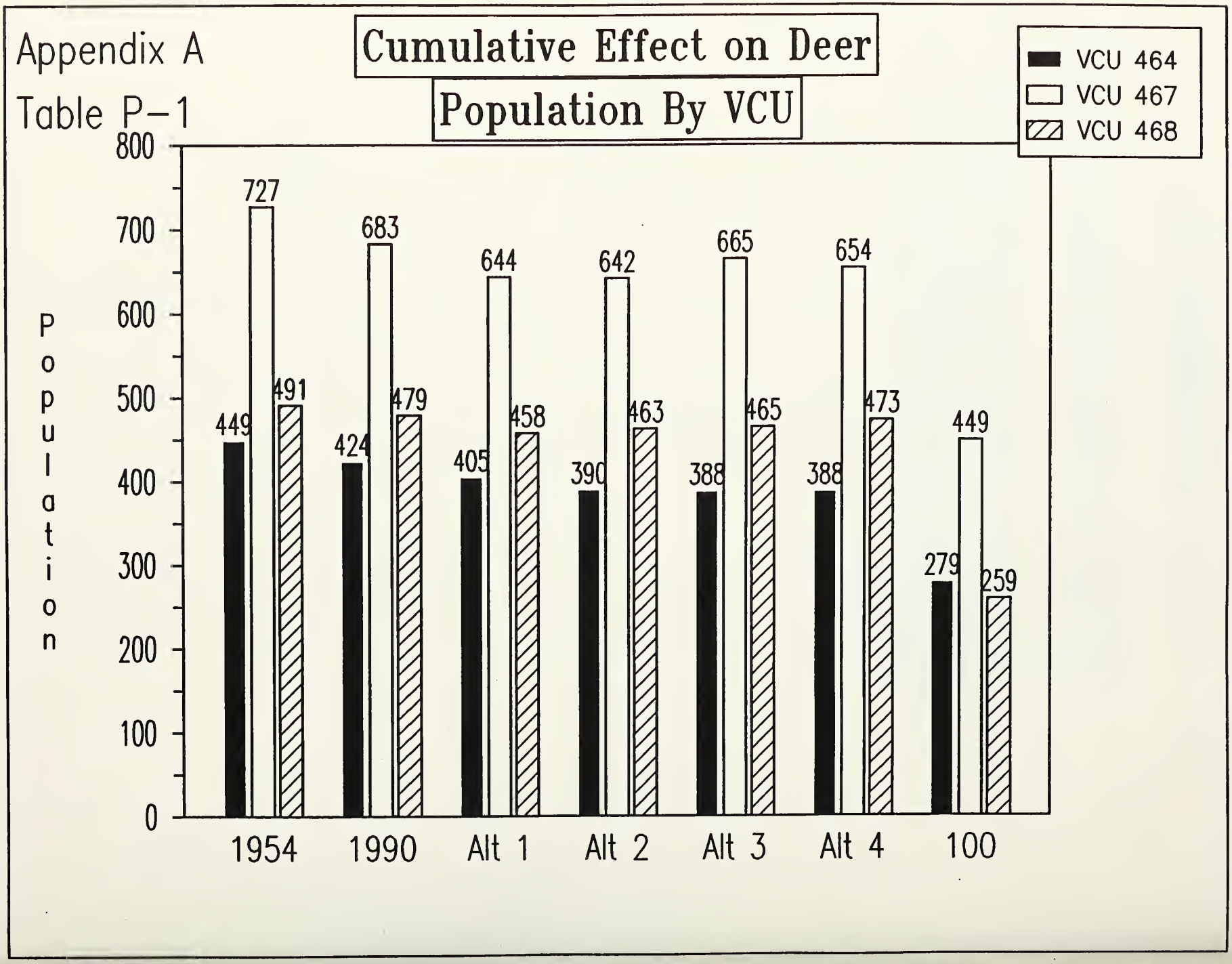
APPENDIX A

The graphs in Table Q-1 through Q-3 display the percentage reduction of the highest quality habitat by MIS between 1954 and 2091 for each VCU. The highest quality habitat was identified by acres receiving the highest Habitat Suitability Index (HSI) value.

Cumulative impacts on populations of MIS were projected for the four time Scenarios: 1) 1954 natural condition; 2) 1990 existing condition; 3) 1991 Alternative Implementation; 3) 2091 One hundred years after implementation. The graph in Table P-1 displays by the proposed action alternatives the reductions in deer populations within the analysis area. Graphs P-2 - P-4 displays the reductions in population numbers for eagle, marten, river otter and black bear by VCU.

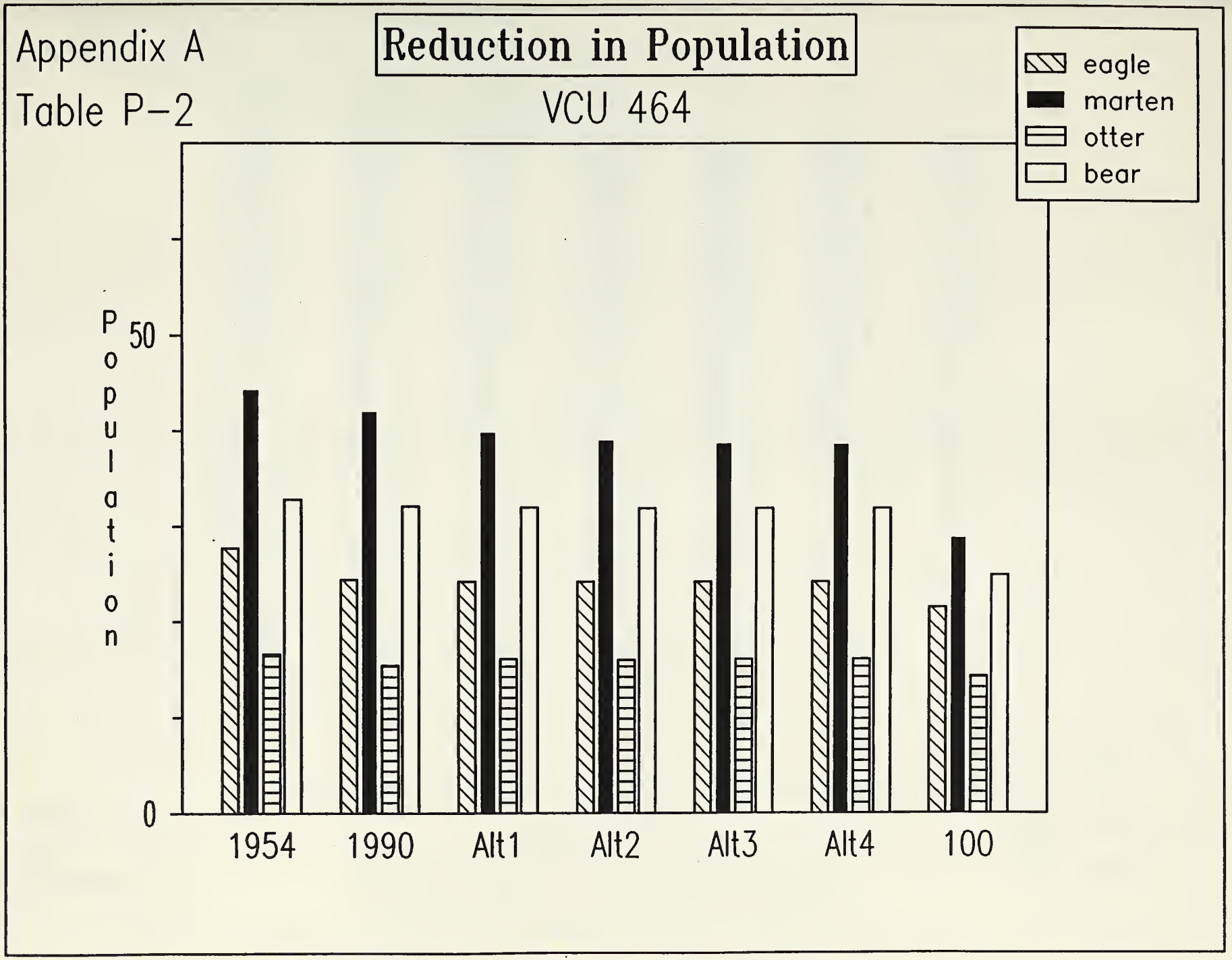
Appendix A

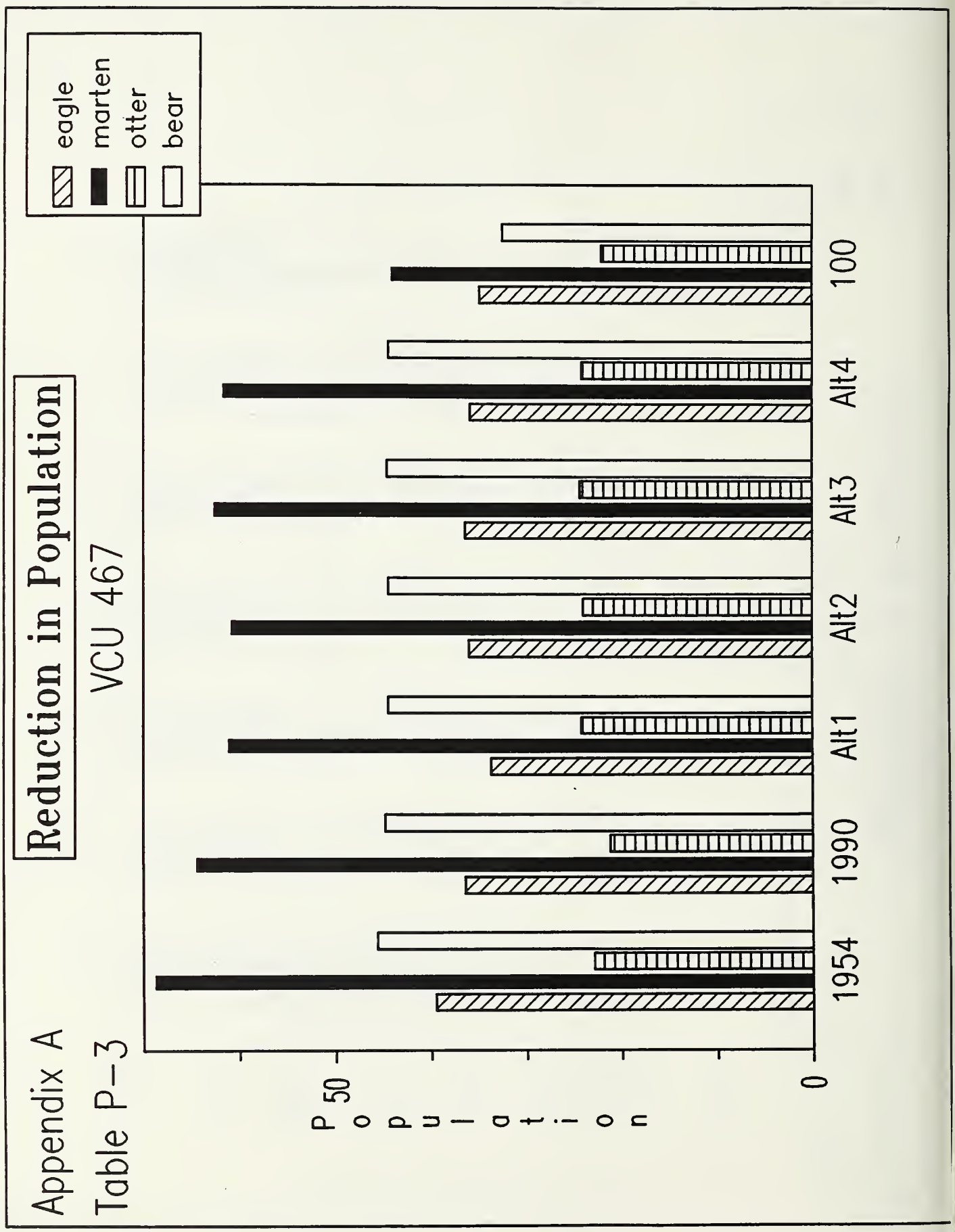
Table P–1



Appendix A

Table P–2



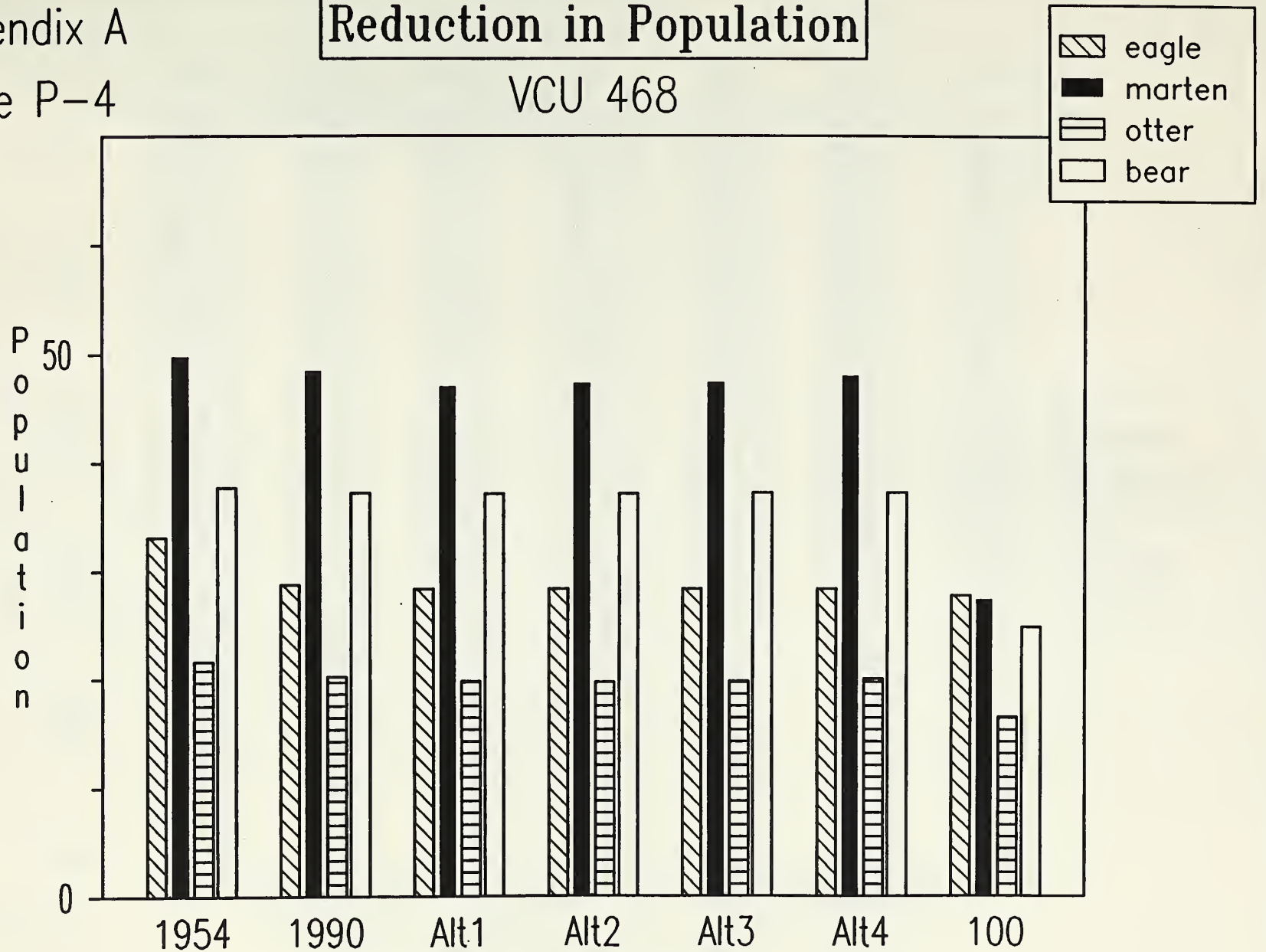

Appendix A
Table P–3
Reduction in Population
VCU 467
eagle
marten
otter
bear
Population
0
50
1954
1990
Alt1
Alt2
Alt3
Alt4
100

Appendix A

Table P–4

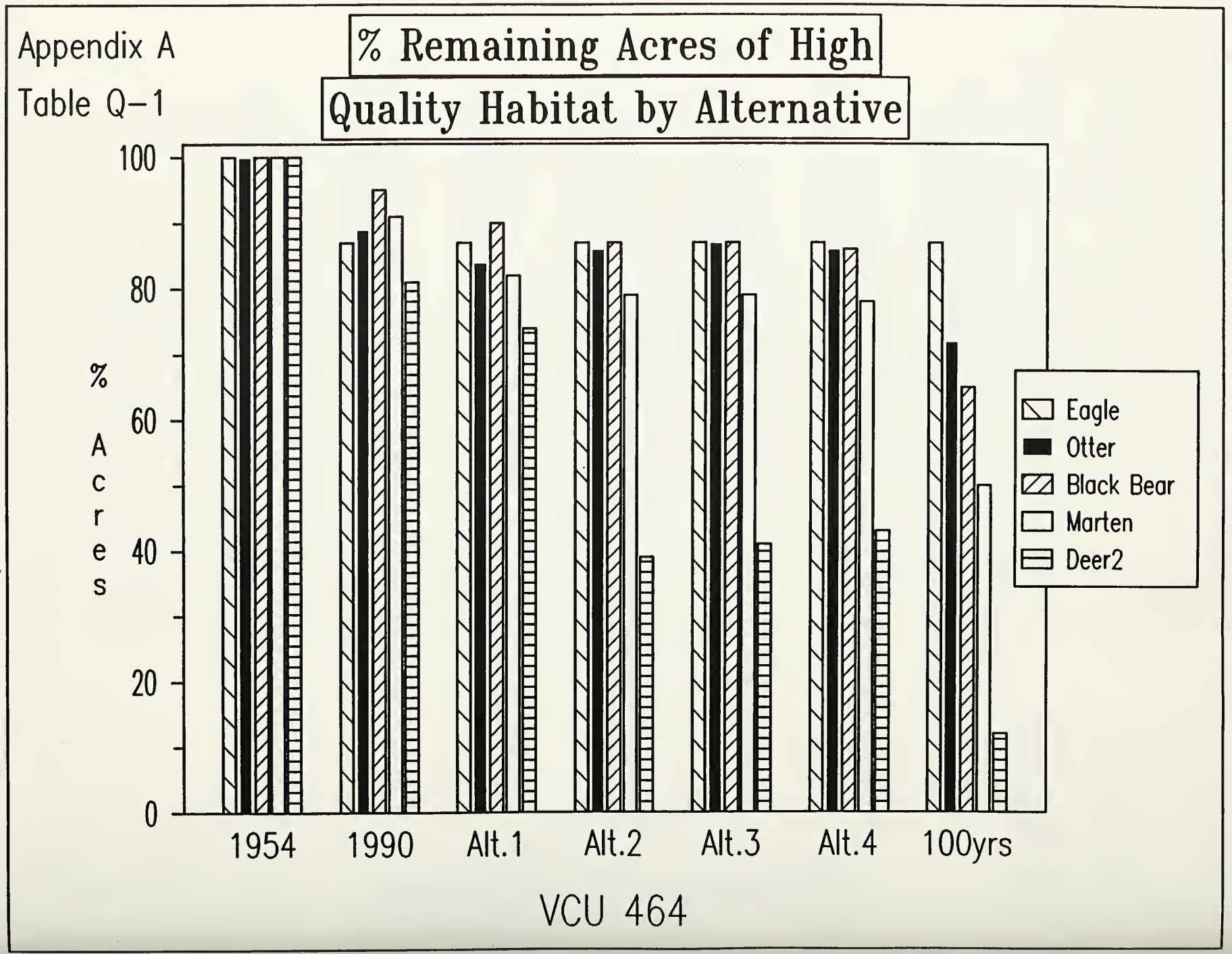
Reduction in Population

VCU 468



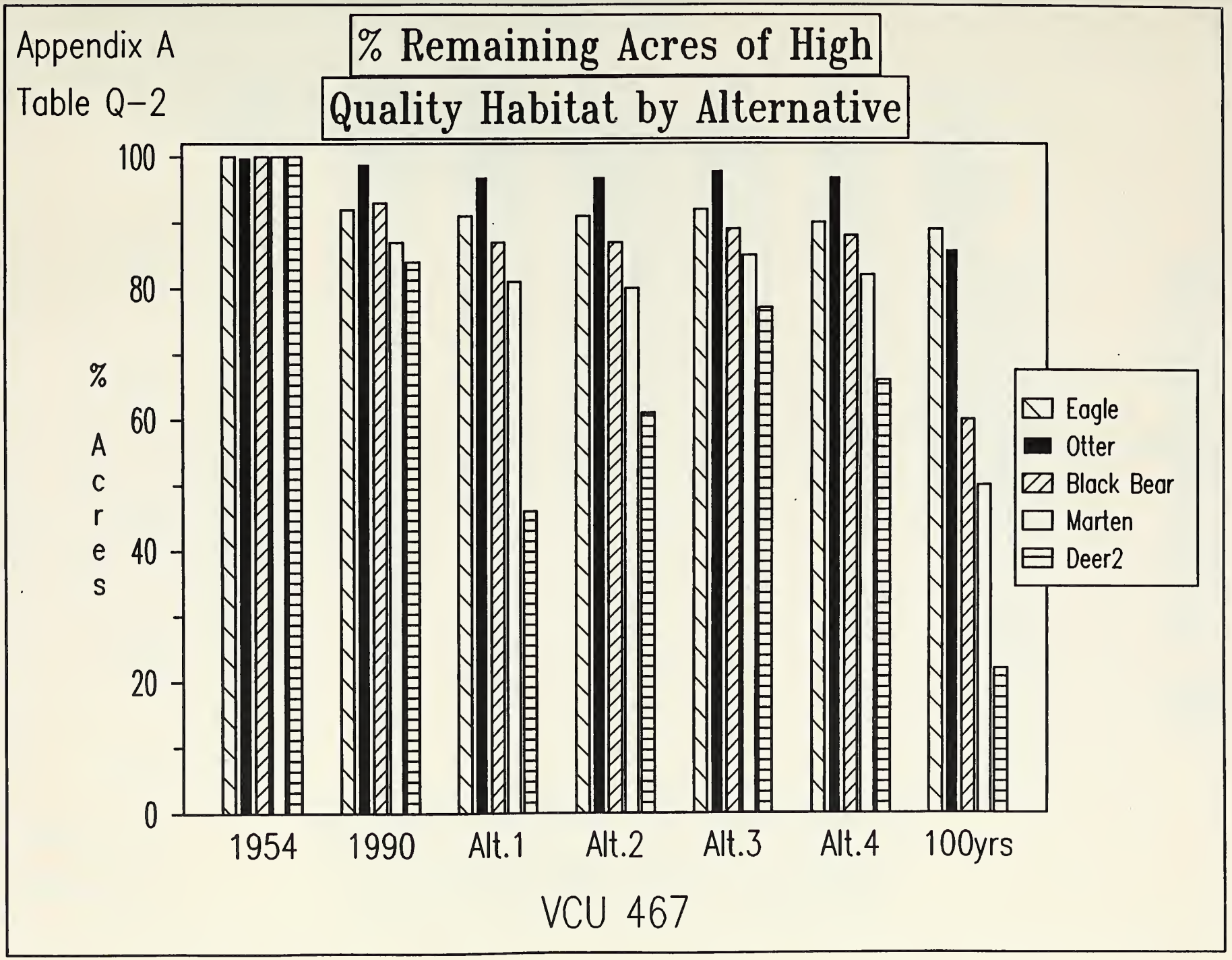
Appendix A

Table Q–1



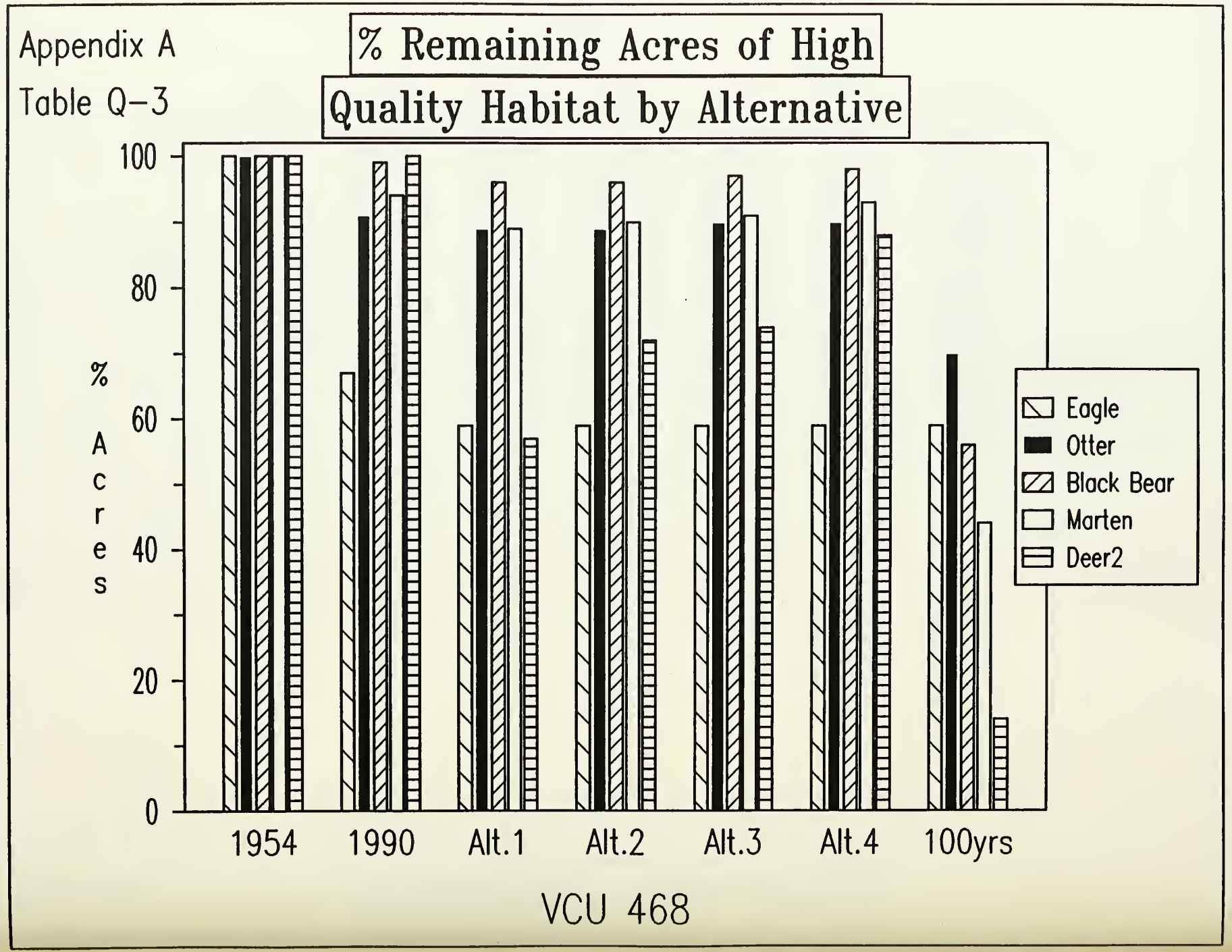
Appendix A

Table Q-2



Appendix A

Table Q–3



Appendix B

Unit Descriptions

APPENDIX B

UNIT DESCRIPTIONS

The following is a capsulation of the IDT analysis of a sample of units proposed in the preferred alternative, Alternative 4. These descriptions are not "unit cards," but the results of the IDT analysis of those cards at this point in time. The unit cards are part of the planning file and can be seen in that file. They will continue to be used through the layout and harvest of units and the survey and construction of roads described in the Forest Service Manual.

It has to be anticipated that there will be some minor changes to the units as depicted on these descriptions. It is virtually impossible, without field verification of every unit boundary, to not have some changes. Exact conformance to preset lines, regardless of values, would not be proper management. Opportunities to not only protect newly discovered situations but also to optimize management intent without changing the environmental impacts have to be anticipated and instituted. The resources, as they are now known and analyzed, have been protected or enhanced to the greatest extent practicable.

If changes and impacts develop which are outside the scope of the impacts envisioned with this Draft EIS, additional documentation may be required.

In the review of the unit descriptions, specific mitigation measures are shown and these should be self-explanatory.

B Appendix

UNIT DESCRIPTION

TIMBER SALE: STARFISH (ETOLIN) Unit Number: 401

ACRES 77 VCU 464 Compartment 239 Stand 801

DEVELOPMENT OF FINAL UNIT BOUNDARY

The original 93-acre unit as delineated on the Unit Layout Card dated 11/90 and as presented on Alternative 4 (1/91) has been altered in design and decreased in size by 16 acres in order to mitigate visual, water quality, and wildlife habitat concerns while utilizing standing sawtimber and utility volume. These concerns and adjustments are described below.

RESOURCE CONCERNS AND MITIGATION

Visuals

Concern: Backline and ROW visible as middleground from Anita Bay and Zimovia Strait.

Mitigation: Layout irregular "fingers" along backline and ROW. A landscape architect should assist layout.

Water Quality

Concern: Channel and sideslope stability in setting 316, bank stability in setting 316a.

Mitigation: Locate landing in eastern corner of setting 316. Provide full suspension and secondary protection on channel in settings 316 and 316a (BMP 13.9 and 13.10).

Wildlife

Concern: Extent of harvest reduces upland landbird habitat potential.

Mitigation: Retain a small block (2-3 acres) along NE boundary of unit 401. A wildlife biologist should assist layout.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Road Development: (Rounded to nearest 0.1 mile)

.4 Miles of Specified Road within unit.
.1 Miles of spur road anticipated.
4 Landings (number)

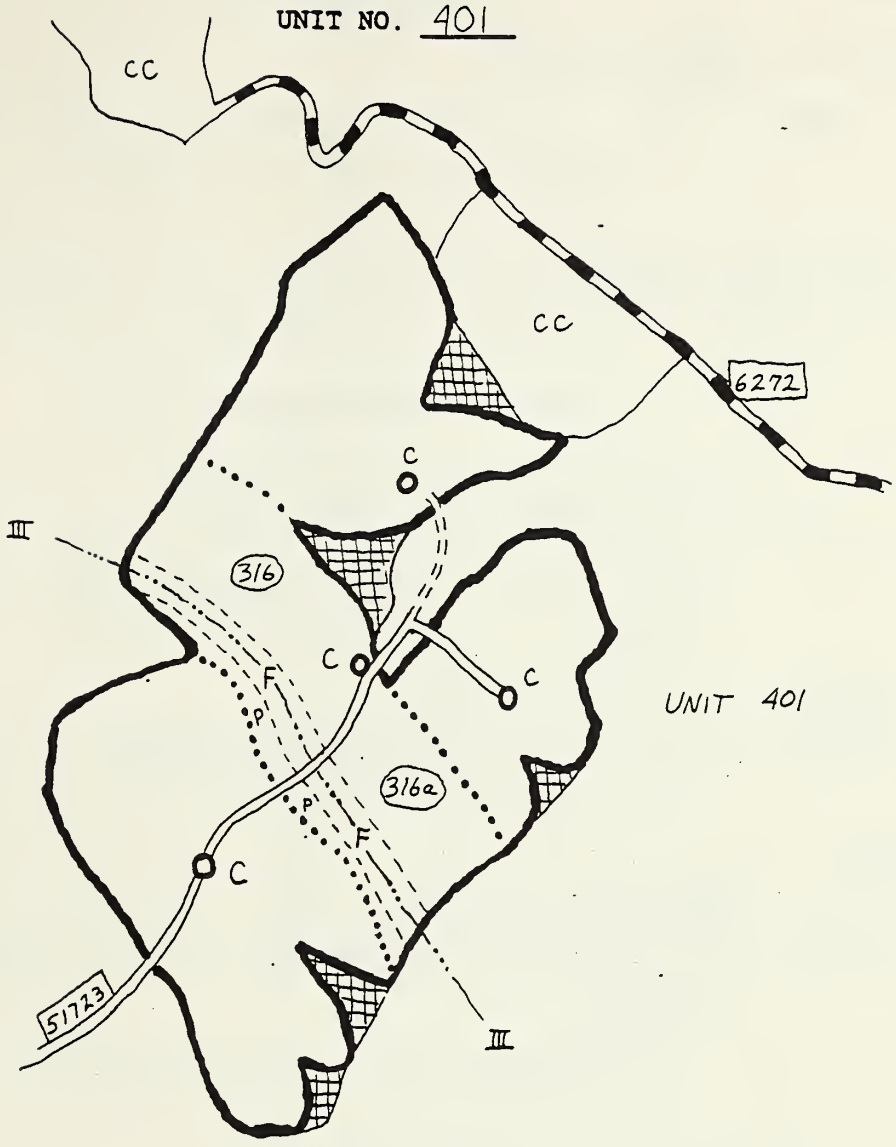
Timber Attributes:

2,231 mbf Estimated total volume within the unit
29 mbf Estimated volume per acre for entire unit
Acres by Volume Class within the unit:
___ Volume Class 4 (8-20 mbf/acre)
77 Volume Class 5 (20-30 mbf/acre)
___ Volume Class 6 (30-50 mbf/acre)
___ Volume Class 7 (50+ mbf/acre)

Stand Management Objectives: LUD IV Rotation Period: +100 years
Regeneration Method: Natural Anticipated Treatments: Precommercial thinning
Other Considerations: _____

UNIT DESCRIPTION

UNIT NO. 401



Approximate Drawing Scale: 1" = 660 feet (top of page is north)

Legend:

Planned Unit Boundary
Setting Boundary
Setting Number (316)
Existing Road
Planned Spec. Road
Planned Temp. Road
Road Number 6272
Permanent Bridge
Temporary Bridge
Landing
Existing Clearcut CC
Internal Exclusions

Helicopter Yarding (clearcut) Hec
Helicopter Yarding (group selection) Heg
Cable Yarding C
Full Suspension F
Partial Suspension P
Watercourse
AHMU Stream Classification III
AHMU Stream Classification boundary
Watercourse-Primary Protection
Watercourse-Secondary Protection
Watercourse with 100-foot Buffer

B Appendix

UNIT DESCRIPTION

TIMBER SALE: STARFISH (ETOLIN) Unit Number: 404

ACRES 25 VCU 464 Compartment 239 Stand 804

DEVELOPMENT OF FINAL UNIT BOUNDARY

This unit remains consistant with prior deliniation on the Unit Layout Card dated 11/90 and as presented in Alternative 4 (1/91). Visual, water quality, and wildlife habitat concerns would be mitigated while standing sawtimber and utility volume would be utilized. These concerns are described below.

RESOURCE CONCERNS AND MITIGATION

Visuals

Concern: The unit would be visible as middleground as seen from Anita Bay and as background from Zimovia Strait.

Mitigation: Tie upper unit boundaries in with existing natural openings. Retain a small (1 acre or less) group of standing timber between spur and mainline in setting 291 to screen spur. A landscape architect should assist layout.

Water Quality

Concern: Stability of channel on western boundary.

Mitigation: Utilize the slope break of this channel as the boundary and prevent the introduction of debris into stream (BMP 13.15).

Wildlife

Concern: Integrity/Stability of terrestrial corridor connecting north and south Etolin Island.

Mitigation: No additional mitigative measures have been incorporated. Unit boundaries are considered to have low-to-moderate blowdown potential.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Road Development: (Rounded to nearest 0.1 mile)

.1 Miles of Specified Road within unit.
.03 Miles of spur road anticipated.
2 Landings (number)

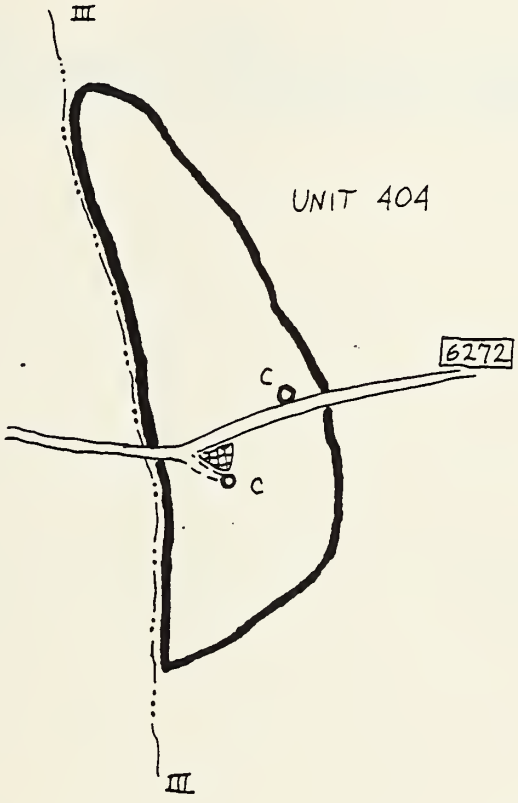
Timber Attributes:

621 mbf Estimated total volume within the unit
25 mbf Estimated volume per acre for entire unit
Acres by Volume Class within the unit:
___ Volume Class 4 (8-20 mbf/acre)
25 Volume Class 5 (20-30 mbf/acre)
___ Volume Class 6 (30-50 mbf/acre)
___ Volume Class 7 (50+ mbf/acre)

Stand Management Objectives: LUD IV Rotation Period: +100 years
Regeneration Method: Natural Anticipated Treatments: Precommercial thinning
Other Considerations: _____

UNIT DESCRIPTION

UNIT NO. 404



Approximate Drawing Scale: 1" = 660 feet (top of page is north)

Legend:

Planned Unit Boundary
Setting Boundary
Setting Number 3/6
Existing Road
Planned Spec. Road
Planned Temp. Road
Road Number 6272
Permanent Bridge
Temporary Bridge
Landing
Existing Clearcut CC
Internal Exclusions

Helicopter Yarding (clearcut) Hec
Helicopter Yarding (group selection) Heg
Cable Yarding C
Full Suspension F
Partial Suspension P
Watercourse
AHMU Stream Classification III
AHMU Stream Classification boundary
Watercourse-Primary Protection
Watercourse-Secondary Protection
Watercourse with 100-foot Buffer

Appendix C

Road Descriptions

APPENDIX C

ROAD DESCRIPTIONS

The following is a capsulation of the IDT analysis of a sample proposed road segment in the preferred alternative, Alternative 4. These descriptions are not "road cards," but the results of the IDT analysis of those cards at this point in time. The road cards are part of the planning file and can be seen in that file. They will continue to be used through the layout and harvest of units and the survey and construction of roads described in the Forest Service Manual.

It has to be anticipated that there will be some minor changes to the roads as depicted on these descriptions. It is virtually impossible, without field verification of every section of road, to not have some changes. Exact conformance to preset lines, regardless of values, would not be proper management. Opportunities to not only protect newly discovered situations but also to optimize management intent without changing the environmental impacts have to be anticipated and instituted. The resources, as they are now known and analyzed, have been protected or enhanced to the greatest extent practicable.

If changes and the associated impacts develop which are outside the scope of the impacts envisioned with this Draft EIS, additional documentation may be required.

ROAD DESCRIPTION

PROJECT NAME: Etolin Implementation MGT AREA: S23 VCU: 464

ROAD NUMBER: 6272 FUNCTIONAL CLASS: Collector ENTRY CYCLE: Constant

LENGTH: 4.9 mi. TRAFFIC SERVICE LEVEL: D DESIGN SPEED: 20 mph

DESIGN VEHICLE: Low-boy CRITICAL VEHICLE: Low-boy HIGHWAY SAFETY ACT: No

MAINTENANCE LEVELS: (ACTIVE SALE) 3 POST SALE: 2

INTENDED PURPOSE: To provide access for timber management activities and Forest Service administration.

TRAFFIC MANAGEMENT STRATEGY: Keep open for administrative use.

EROSION CONTROL: Full bench and end haul at point 'D' for approx. 200 ft. and at pt 'E' for approx. 100 ft. to avoid sidecast of material into two small channels.

ROAD LOCATION: Main objective was to place the road to take advantage of the major slope break running along segment 'CF' for landings and visual screening.

ROCK PITS: Coordination with landscape architect is required as there are visual concerns regarding rock pit development along the entire length of Rd. 6272. There is the possibility of a pit at 'E' that may not be seen from Anita Bay.

STREAM CROSSINGS: No fish streams or tributaries to fish streams are crossed.

FUTURE NEEDS: This road may connect to the Olive Cove road system providing an intertie between the Olive Cove area and the interior of Etolin Island.

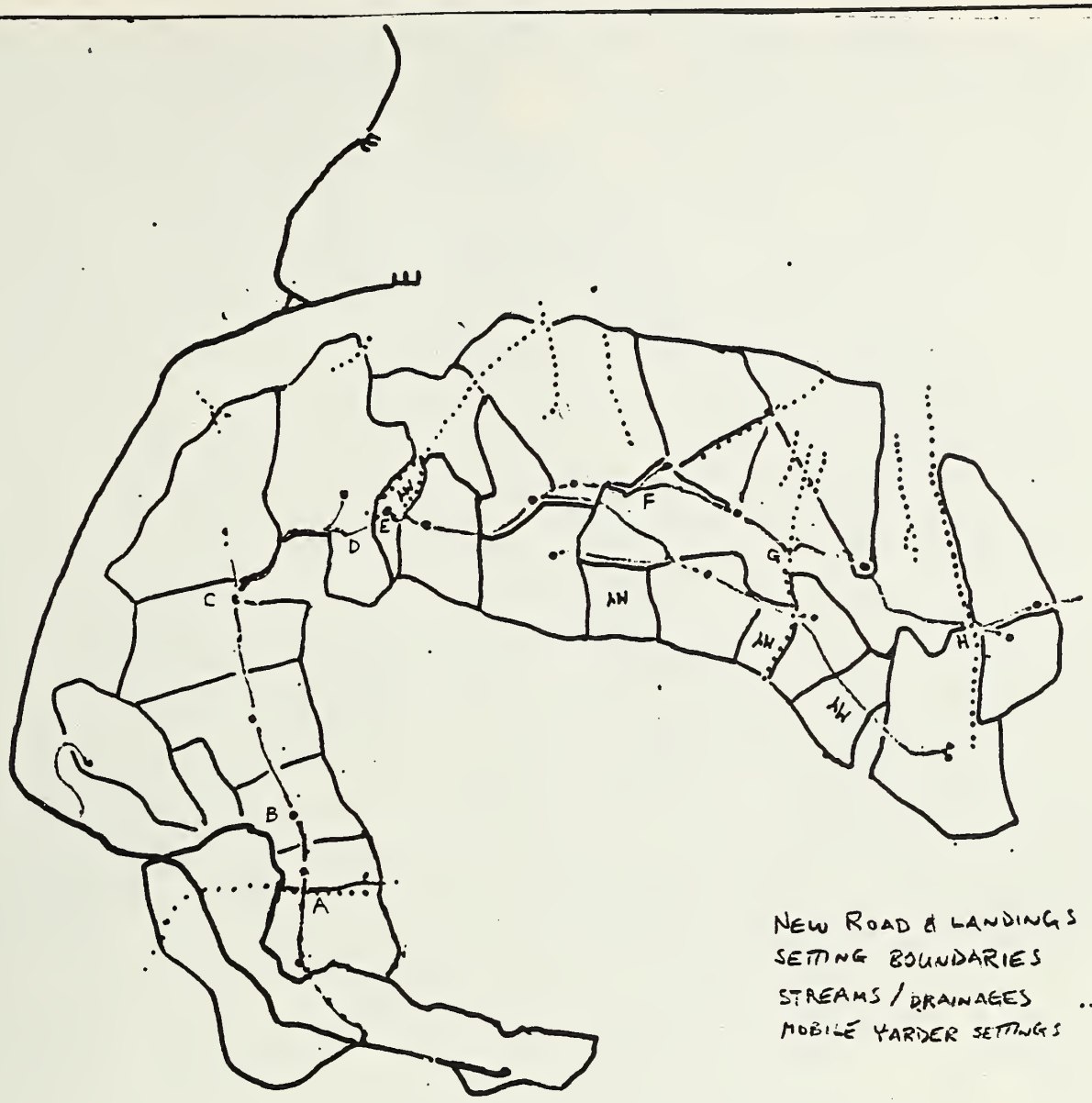
VEGETATIVE MGT: Between the two landings on either side of pt. 'G' sideslopes are 45-60%. The scrub cedar and hemlock along the segment is intended to serve as a visual screen, so clearing limits should not extend beyond the toe of fill.

TIMING RESTRICTIONS: None

MONITORING NEEDS: None

OTHER CONSIDERATIONS:

SPECIALISTS NEEDED: Geotech, Landscape Architect



ENGINEERING CONSIDERATIONS

RCA 10/90

ngineering/Transportation/Geotechnical considerations: (Locate on photo/map if possible)

A. 20' DEEP V-NOTCH, 50' BRIDGE.

-C. ~1900' OF CONSTANT 15% GRADE.

D. 200' OF FULL BENCH.

E. POSSIBILITY OF ROCKPIT NOT SEEN FROM WATER. JUST PAST 'E', 100' FULL BENCH AT 15% GRADE.

F. POSSIBILITY OF ROCKPIT FACING INLAND (~320°) (BIG GRANITE)

G. FULL BENCH IN & OUT, 10' FILL ON 45% GRADIENT STREAM, 36" CMP. BETWEEN LANDINGS CLOSEST TO 'G' SIDESLOPES 45-60%. SCRUB CEDAR/HEM. WILL SERVE AS VISUAL SCREEN.

H. CONTROL POINT, TOUGH CROSSINGS BELOW.

C Appendix

Date: 8/19/73 Flight Line: 17 Roll: 973 Print Number: 85

(Photo copy of aerial photo or location plotted/mapped with problem spots/concerns discussed below.)

ENGINEERING CONSIDERATIONS

ngineering/Transportation/Geotechnical considerations: (Locate on photo/map if possible)

A. 20' DEEP V-NOTCH, 50' BRIDGE

-C. ~1900' OF CONSTANT 15% GRADE

>. 200' OF FULL BENCH.

E. POSSIBILITY OF ROCKPIT NOT SEEN FROM WATER. JUST PAST 'E', 100' FULL BENCH AT 15% GRADE.

F. POSSIBILITY OF ROCKPIT FACING INLAND (~325°)

G. FULL BENCH IN & OUT, 10' FILL ON 45% GRADIENT STREAM, 36" CMP. BETWEEN LANDINGS CLOSEST TO 'G' SIDESLOPES 45-60%. SCRUB CEDAR/... WILL SERVE AS VISUAL SCREEN.

H. CONTROL POINT, TOUGH CROSSING BELOW.

Appendix D

Stream Channel Process Groups

APPENDIX D

STREAM CHANNEL PROCESS GROUPS

The term "process group" refers to a group of stream channels that were all formed by the same geologic processes. This appendix describes nine different process groups, lists the stream channel types in each group, and explains some of the management implications of each group.

Floodplain Stream Channels

These are channels (designated as B1, C1, C3, C4, and C6 chanel types in the process group delineation in Draft F of the Tongass Land Management Plan revision) with active floodplain development. Floodplain channels have a two-way interaction between the stream channel and the floodplain area through bank erosion, channel migration and overflow, leaf fall, and blowdown/tree fall. Alluvial channels process energy for the stream and are an important source of nutrients. Flooding is a fundamental process in alluvial channels. The riparian zone is usually very broad and adjacent upland plants do not directly influence the riparian areas.

The riparian areas are extremely dynamic because streamflows within alluvial or uncontained areas are generally poorly contained and flood during seasonal or individual storms. Stream channel banks consists of unconsolidated materials, either alluvial sands, gravels or organic material. Channel migration and braiding of the stream channels occurs with varying frequency, depending on bank and bed stability. The bed and bank stability are usually tied to the adjacent plants. Trees and shrubs are very important to controlling the stability of the streambands, as their root network often is the only thing holding together the unconsolidated alluvial streambank soil. Large Organic Debris (LOD) plays an important role in controlling the stability of the stream bed and banks by regulating the stream's energy dissipation. Habitat forms in the pool riffles caused by the energy dissipation. The riparian area adjacent to the alluvial channels encompasses the channel banks, active channel floodplain, sloughs, backwater overflow channels, and ponded swales. Because of the interactions of the stream with the adjacent landform, the alluvial channels contain a richer, more abundant community of fish than found in contained stream channels.

Channels on the Alluvial Fans

These channels (designated as A3 and B5 in the process group delineation in Draft F of the Tongass Land Management Plan revision) are transitional, being streams that are dominated by both sediment transport and sediment deposition. High energy streamflows of low to moderate magnitude are delivered to fans from their upstream contained drainage basins. Flood flows which occur espisodically are a result of flash floods or debris torrents delivering high volumes of sediment which are quickly deposited on the streambed, streambanks, and areas adjacent to the stream. Stream channel migration or abandonment often occurs during these events. The stream channels are numerous and are generally found throughout the fan area. Many of the channels are ephemeral.

The rearing and spawning habitat value of fan channel types for salmon and trout varies from high or low. The channels are unstable, and sometimes intermittent during low streamflow periods in the summer and winter months, thereby limiting their use for rearing coho salmon and resident trout. The gravel beds are unstable due to the high energy flows and the large amounts of coarse gravels moving through the fan channels, so successful spawning is limited. However, on the toe end, or lower gradient portions of the fans, the value is higher for spawning and rearing for coho and pink salmon. Where abundant LOD is present, the value for coho salmon can be moderate to high. The toe ends are also characterized by more stable gravel beds, thereby increasing spawning value.

Channels with "Mixed" or Colluvial Control

As the name implies, these channels (designated as B2 and B3 channels in the process group delineation in Draft F of the Tongass Land Management Plan revision) are a mixture of stream channel containment. Some segments are controlled by bedrock or the valley walls, while other areas have minor floodplains. Within these moderate gradient channel types, the bedrock segments of the channel act as sediment transport systems, while bed materials are deposited in the lower gradient and floodplain development is apparent.

The habitat capability and sensitivity of these channels to disturbances caused by management is midway between floodplain and contained channels. The importance of the interaction between the stream channel and riparian vegetation is intermediate. Much of the better rearing habitat, particularly the coho salmon winter refuge habitat, is associated with LOD accumulations in the stream. Within "mixed" channel types microhabitats that provide winter refuge may be even more important than in the alluvial streams.

Low Gradient Contained Channels

These are streams (designated as C2, C5 channel types in the process group delineation in Draft F of the Tongass Land Management Plan revision) where the channel is contained by the adjacent landform with the channel having little effect on that landform. The adjacent influence zone often extends to the slope break above the incised valley slope. The width of the zone of influence on the aquatic habitat is dependent upon the adjacent upland soils and vegetation (primarily trees). The adjacent vegetation plays as major role in controlling the rate of downslope movement of soil into the stream channels, as well as providing energy dissipation structures in the stream channels to trap and store sediment that is being transported downstream.

The lower gradient channels contain habitat for large numbers of spawning pink salmon, particularly in the lower segments where large accumulations of suitable sized spawning substrates exist. Rearing habitat, particularly winter refuge habitat, is limited to sections of the stream where large quantities of LOD have accumulated in the stream.

Appendix E

Soil Hazard Classes

Moderate Gradient Contained Channels

These channels (designated as B4 and B6 channel types in the process group delineation in Draft F of the Tongass Land Management Plan revision) are also contained by the adjacent landform, with moderate instream gradients. Stream energy, substrates, and run-off are effectively contained by landform or streambank features. When the adjacent sideslopes are short, low gradient, or absent the influence zone is narrow. This group can have streams with very large, high gradient sideslopes which correspond to large areas that influence stream conditions. These streams are very much influenced by the highly sensitive natures of these sideslopes.

The moderate gradient channels contain limited amounts of anadromous fish habitat. When access is available, spawning habitat is limited due to lack of suitable sized substrates. Rearing habitat is limited to summer habitat for coho and steelhead trout. Moderate gradient contained channels usually provide moderate resident fish rearing potential.

High Gradient Contained Channels

These channels (designated as A1, A2, A4, A5, A6, A7 and B7 channel types in the process group delineation in Draft F of the Tongass Land Management Plan revision) are source streams for downstream waters and transport organic and inorganic sediments to the downstream habitats. The stream channels are well contained within the narrow valley bottoms. Channel banks are steep and generally composed of large material, either consolidated bedrock or well packed boulders, rubble, and cobbles. The riparian vegetation along currant brush communities. The channels are predominately influenced by the upland or terrestrial plant communities. Soils in the adjacent upland area are often shallow and subject to downslope movement. Leaves, forest litter, and trees often move downslope into these incised channels when disturbance occurs.

High gradient contained streams generally do not produce anadromous fish, as numerous waterfalls and cascades prevent access. The lack of high quality rearing pools limits the production of resident fish.

Glide Streams

These channels (designated as L1 and L2 in the process group delineation in Draft F of the Tongass Land Management Plan revision) occur throughout the watershed on gently sloping lowlands landforms and are frequently associated with bogs and marshes, or lakes. Because of the low gradient, most of the sediment being transported in the stream channels is sand sized or smaller, and much of it settles out in the gently gradient channels. Though the channels are shallowly incised, and have fair flow containment, flood flows usually overtop the streambanks and flow onto the adjacent landform, lessening downstream flooding and serving as a buffer during major storms. Low gradient, slow flowing streams are often associated with temperature sensitive watersheds. The lower banks are composed of material that erodes easily. Productivity of the channel is moderately tied to the riparian/terrestrial interaction. The bank trees control the channel stability in the floodplain control areas.

Glide streams have moderate to high capability for coho salmon. Spawning gravels are not abundant, but are usually sufficient to fully seed the available habitat. The channels provide summer coho rearing habitat, but usually more limited "overwinter" habitat, due to the lack of abundant large complex pools that provide quality winter refuge. C7 channels that form the outlet channels of lakes do provide good overwinter habitat due to the temperature moderation of the upstream lake waters. The better rearing habitat, particularly winter refuge habitat is tied to undercut banks and LOD controls the long term maintenance of much of the rearing and spawning habitat. The channels are frequently used by pink salmon for spawning.

APPENDIX E

SOIL HAZARD CLASSES

Mass-wasting as used here is restricted to relatively shallow translational failures of the soil mass, and specifically excludes deep rotational failures and debries failures within stream channels. While slope gradient is the primary site factor determining the stability of natural slopes, soil and geologic properties, such as cohesion, moisture regime and the presence of a prominent slip-plane are used to determine relative stability of soil/landtype units. The relative ranking is based on state-of-the-art research, laboratory data on soil properties, as well as our collective experience in the management of similar soil/landtype areas on the Tongass N.F.

HIGH

The soil/landtype units in this class are the least stable, and have the greatest probability of slope failure. These units generally have slope gradients that exceed the natural angle of stabilty. It includes most well drained soils on slopes of 75 percent or greater, as well as some soils with restricted drainage (somewhat poorly and poorly drained soils)on slopes in excess of 65 percent. Most natural occuring landslides initate in units of this class. They often, but not always, have visible indications of instabilty or past failures, such as slide scarps, tension cracks, jack-strawed trees, mixed pedogenic horizons etc.

The risk of management induced slope failures is so high on these areas that they are generally precluded from normal forest harvest and roading activities. Where management activies can not be avoided on these areas, site specific investigations are necessary to determine on a case-by-case bases; (1)the probability of failure based on a site-specific stability analysis; and (2) the likely effect of a failure on associated resources such as water quality, fish habitat, etc. Forest roads can sometimes be built on these areas by locating them on included areas of less slopeing benches, or by the application of unusual, and often prohibitively expensive, mitigative measures such as retaining walls, buttresses, bulkheads or other external support systems.

MODERATE

The soil/landtype units in this class are generally stable in an undisturbed condition, however, any natural disturbance or management practice that adversely changes the complex soil strength-stress relationship can result in slope failures. These areas rarely have visible indications of instability.

Soil/landtypes in this class can be safely managed without a high risk of landslides by application of management practices designed to maintain the shear strength of soil and roots, and avoid increasing the effective weight of the soil mass. Management practices should be designed to avoid interrupting the natural surface and subsurface drainage patterns and minimize disturbance to the soil surface.

LOW

Soil/landtype units in this class have the least probability of landslides. Any slope failures that do occur are usually associated with included incised stream channels (V-notches), or short steep escarpments. This class includes most soils with slope gradients less than 35 percent.

These areas are normally not subject to mass wasting, however management practices designed to protect streambanks and v-notches, and prevent surface erosion are appropriate.

Appendix F

Bibliography

APPENDIX F

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